



Animal Markets and Zoonotic Disease in Australia

COUNTRY SUMMARY: AUSTRALIA

CULTURAL CONTEXT

Australia is home to just 0.3% of the world's population, but accounts for 1.7% of the global economy. European colonization triggered radical alteration of Australia's native ecosystems. Disease and frontier warfare ravaged and decimated populations of the land's indigenous inhabitants, and colonization instituted a colossal, continuing process of deforestation. Vast grazing pasture allows Australia to market its meat and food animals as healthy, clean "green" commodities and to attract premium prices internationally. For many, Australian identity is strongly associated with meat production and consumption, and the country remains one of the largest producers of livestock, many of whom are sold for live export to the Middle East or elsewhere.

ANIMAL MARKETS

Horses, cattle, sheep, goats and camels are the primary animals sold in live markets in significant numbers in Australia. Some 300,000 people fully or partially own a racehorse in Australia, and Australia sells about 19 million sheep and 6 million cattle annually, operating a major export industry sent by ship to mostly Asia and the Middle East. The most important live animal markets are saleyards, physical markets where buyers and sellers trade livestock at auction. Large producers sometimes sell directly to abattoirs, or direct to live exporters or other farmers in private sales. Poultry are collected by catchers or mechanized killing. In preparation for sale, cattle and sheep are gathered in the fields by people on motorbikes and horses are rounded up in vehicles, airplanes, and helicopters. Cattle and sheep are then transported to their buyer by road, mostly in articulated trucks. In addition, horses, pigs, poultry, alpacas, goats, camels, emus and buffalo are among the approximately 970 million animals transported by road annually across Australia.

DRIVERS OF ZONOTIC DISEASE RISKS

Alteration of wildlife habitat and populations due to rising temperatures and human land use is creating new patterns of interactions between wild and farmed species and new opportunities for disease spread, as is the case with fruit bats, carriers of Hendra virus. While food from animals and animal products meet high standards for hygiene, certain features of Australian agricultural practices nevertheless present significant risk of outbreak and spread of disease and zoonotic spillover. Animals transported from farms are exposed to multiple kinds of stress including close confinement, movement, and inadequate food and water. Transport increases the risk of infectious disease acquisition from other animals in transit. Stressed animals come into contact with humans and each other at farmers' markets and saleyards as well as on the properties where they are rehomed (if they are not sold directly to the slaughterhouse). In

saleyards, processes are inadequate for identifying sick animals. On-site veterinarians are rare; identifying and dealing with sick animals is largely left to selling agents, farmers, livestock inspectors, drivers and saleyard staff. Risk of disease among exported livestock is increased by the unhealthy and stressful conditions on live export ships, as well as the stress endured over several weeks or months as animals are moved from Australia grazing lands to the slaughterhouses in importing countries. The live export industry presents significant risks of cross-continental spread of zoonotic disease.

RISK MITIGATION AND RELEVANT CHALLENGES

Biosecurity and disease surveillance in the livestock industry is critical to prevent the spread of zoonotic disease. But short-term economic interests sometimes take precedence, creating serious potential risks. Herding livestock together into densely packed trucks and pens, and exporting cattle and sheep over long distances by sea alive are high-risk practices that should be closely and independently monitored. Broad-based conflicts across industry, agricultural land-holders, and conservationists prevent meaningful action on reducing livestock-driven deforestation and preserving natural habitat for wildlife, essential in putting a stop to biodiversity loss and associated emerging diseases.

AUTHORS

This report was written by Dr. Clive Phillips (Curtin University, Australia) and Dr. Dora Marinova (Curtin University, Australia), with additional research and editing from Lana Nadj.

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INTRODUCTION

More than two centuries ago, Europeans colonised the land now called Australia, in an act that triggered a radical alteration of the ecosystems of the continent, with devastating consequences for First Nations communities and for Country¹. Disease and frontier warfare ravaged and decimated populations of the land's indigenous custodians, and colonization instituted a colossal and continuing process of deforestation. In Australia's northern regions, particularly within the State of Queensland,² the clearing of land for pastoral use has been so widespread that it has been compared in recent decades with the logging of the Amazon because of the carbon emissions created,³ the scale of clearing, and its global significance. On encountering the "uninhabited" continent deemed *terra nullius*, the British explorer Sir Thomas Mitchell had wondered at its landscaped appearance.⁴ Indeed, the land had been managed before colonization for some 60,000 years or more by its original inhabitants, indigenous Australians who employed fire and ancient aquacultural and agricultural practices, including harvesting and resowing great fields of tubers such as parsnip yam (*Dioscorea transversa*), white yam (*D. bulbifera*), and murnong (*Microseris lanceolata*). These were important staple foods, the harvesting of which fostered loamy soils.⁵

The vastness of the continent gave generations of settlers extensive grazing pastures for hoofed pastoral mammals that were adapted not to Australian soils and temperatures, but to foreign conditions. In Australia's Northern Territory and in the States of Western Australia and Queensland, sheep and cattle roam semi-arid and monsoonal regions across distances of such enormity that they are mustered sometimes by helicopter. The assignment of vast tracts of land for pasture allows Australia to market its meat and food animals as healthy, clean, "green" commodities and to attract premium prices internationally,⁶ but while food from animals and animal products do meet high standards for hygiene, certain features of Australian agricultural practices nevertheless present significant risk of outbreak and spread of disease and zoonotic spillover. Despite being termed "extensive," at important junctures within agricultural systems, including those that produce red meat and wool, animals of the same species are brought together to congregate in large numbers in conditions that are sometimes stressful and, indeed, sometimes fatal. Regular instances of these intensive aspects of live animal farming within different supply chains include when animals are carried within trucks for long-distance transportation, corralled on ships in large numbers as live ocean cargo, and when held in feedlots and saleyards. Further, economically important food including dairy products, chicken, pork, and salmon are produced in Australia using intensive agricultural systems characteristic of those adopted by geographically smaller or more populous nations. 90% of Australian pork derives from the slaughter of pigs who are housed in

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1. Country is the term used by First Nations peoples (without an article) to denote "the lands, waterways and seas to which they are connected. The term contains complex ideas about law, place, custom, language, spiritual belief, cultural practice, material sustenance, family and identity." "What is Country?" AIATSIS, last modified May 25, 2022, <https://aiatsis.gov.au/explore/welcome-country#toc-what-is-country->.
 2. Queensland accounts for 39% of all of Australia's forest, far more than any of the other states or territories; the Northern Territory, within whose borders the second-largest share of forested land is found, accounts for 18%: Evgeny Guglyuvatyy, *Climate Change, Forests and Federalism* (Singapore: Springer, 2022), 64-65.
 3. Evgeny Guglyuvatyy, *Climate Change, Forests and Federalism* (Singapore: Springer, 2022), 73.
 4. Bruce Pascoe, *Dark Emu* (Broome: Magabala Books, 2019), 141.
 5. Lesley Head, "Yams," in *Plants: Past, Present and Future*, by Zena Cumpston, Michael-Shawn Fletcher, and Lesley Head (Port Melbourne: Thames & Hudson, 2022), 116; Bruce Pascoe, *Dark Emu* (Broome: Magabala Books, 2019), 26-27.
 6. The ability to claim to be free of foot-and-mouth disease also allows Australian producers of "red" meat to levy "significantly higher" prices than their many competitors: Australian Government Productivity Commission, *Regulation of Australian Agriculture: Productivity Commission Inquiry Report 79*, (November 15, 2016): 321.

pens or crates for their entire lives.⁷ Likewise, chickens are overwhelmingly reared in barns and cages, and the relatively new industry of salmon farming in Tasmania relies largely upon densely packed “floating feedlots”⁸ in formerly pristine waters.

Land-clearing and disease have placed unique animals including the iconic koala at critical risk, and devastating wild bushfires have amplified the danger. Bushfires and land-clearing create opportunities for zoonotic spillover. Today, clearing vegetation for urban development and the conversion of forests for grazing (predominantly for use by sheep and cattle) have brought urban sprawl into previously wooded areas. This overlap has, in recent years, seen fruit and blossom bats (known as flying foxes) roosting in and feeding on their preferred species of eucalypts,⁹ in proximity, with some frequency, with members of Australia’s one-million-strong horse population.¹⁰ Horses are typically bred for use on the land and for racing —although Australia also has the world’s largest population of wild horses in its interior, the legendary “brumbies.” In the Brisbane suburb of Hendra, in 1994, a zoonotic spillover from horse to human of a pathogen found in flying foxes, HeV, took place with tragic consequences. Not long thereafter, in 1996, a 39-year old fauna rehabilitator in Rockhampton became the first known human to be infected with the novel zoonotic pathogen, the Australian bat Lyssavirus (ABLV), after being scratched by a flying fox in her care. The ABLV is unrelated to HeV (Hendra virus). Although similar to rabies, ABLV is unique to Australia, one of very few countries that is free from rabies in its domestic animal species.

The ABLV virus is present in the yellow-bellied sheath-tail bat and other flying foxes and is fatal to humans, but does not pass through a host or reservoir species before infecting humans as the Hendra virus does. However, in 2013 the first confirmed cases of two horses infected with ABLV were detected.

The risk of viral evolution and zoonotic spillover events in Australia is exacerbated by certain factors (such as intensive farming practices and land clearing) and conversely, it is mitigated by constraints. While there is a National Livestock Identification System to enhance biosecurity, in practice it has significant shortcomings. Agriculture is, of course, regulated, but the risk of industry capture is an ongoing problem, as the elevation of the farmer within Australian culture combined with certain structural incentives within the institutions of the agricultural regulators result in their prioritization of the commercial exploitation of animals over animal welfare. Also, although an animal can be productive in commercial terms while its welfare is poor, this often requires the use of antibiotics; where use is widespread, antibiotics in animal agriculture create a risk of antimicrobial resistance. In Australia, publicly available data on the extent of antibiotic use in agriculture are difficult to obtain. Even though biosecurity and commercial agricultural interests in Australia are broadly aligned (as perceptions that animal sectors are disease-free result in higher export prices), the experience of illness and death on live export ships, overcrowded long-distance trucks and overcrowded pens in many saleyards and farmers’ markets, along with the reported administration of antibiotics to intensively farmed pigs, in large numbers, reveal important blind spots in Australia’s biosecurity with significant implications for animal and human health.

7. “Indoor System Farming,” Australian Pork, accessed October 15, 2022, <https://australianpork.com.au/about-pig-farming/indoor-system-farming>.

8. Richard Flanagan, *Toxic: The Rotting Underbelly of the Tasmanian Salmon Industry* (Penguin Random House Australia, 2021).

9. Leslie S. Hall and Gregory Richards, *Flying Foxes: Fruit and Blossom Bats of Australia*, (Malabar, FL: Krieger Publishing Company, 2000), 76.

10. Edward J. Annand et al., “Novel Hendra Virus Variant Detected by Sentinel Surveillance of Horses in Australia,” *Emerging Infectious Diseases* 28, no. 3 (2022): 693-704.

CONTEXT

Part of Oceania, Australia is a predominantly hot island-continent, located in the southern hemisphere. It is the sixth largest country in the world by total area with a population of only 26 million, 86% of whom live in urban areas.¹¹ Over its immense distances, introduced species bred as livestock (for food) are transported to slaughterhouses, ports or to drought or flood-affected properties for restocking, usually by truck or by droving, on a regular basis. The continent's desert interior is riddled with dry river beds punctuated by unconnected pools and vast, dry salt-lake basins such as Kati Thanda (Lake Eyre). During twice-in-a-century inundations,¹² however, the inland desert seabeds fill completely, the riverbeds burst with rainwater and the red sands become green expanses with hundreds of narrow lakes held by dunes, turned into clay by the floods. During such heavy rains, fish fill the channels in great numbers and support major breeding events for native birds; grasses and wildflowers bloom and attract reptiles and marsupials in spectacular explosions of life.¹³ Australia's native species include 140 species of marsupials (kangaroos, wombats, koalas, quokkas, bandicoots, wallabies, bettongs, bilbies, numbats, quolls, possums and the Tasmanian devil) and two monotremes (the echidna and platypus). There are also over 140 species of Australian placental mammals, including 75 types of bats, 45 native rodents, and dingos. More than 80% of mammals, frogs, reptiles, and freshwater fish, and almost half of its birds, are unique to Australia.¹⁴

Australia is an important destination for migratory birds from the northern hemisphere and Asia, through the Timor-Northern Territory/Western Australia route and the Papua New Guinea-Cape York route.¹⁵ Although pathogenic strains of avian influenza tend to emerge in farmed bird populations, wild birds can carry the virus asymptotically, and in Southeast Asia, and central China, during outbreaks of HPA1 H5N1, wild migratory birds in large numbers, including ducks, geese and swans, were found dead along migratory routes.¹⁶ Other species that travel long distances to other land masses include the black flying fox (*Pteropus Alecto*). Individual black flying foxes monitored by telemetry have been observed to fly from Australia to Papua New Guinea, from Papua New Guinea to Indonesia, and to cross the Torres Strait.¹⁷

Before colonization, for many thousands of years indigenous communities used fire (including undertaking frequent, small-scale burning) to protect sacred sites and watercourses, and to control understorey species in forests, possibly causing gradual changes to vegetation zones across the continent.¹⁸ Importantly, periodic burning reduced the fuel loads available for wildfires. Fire intensity and timing were carefully controlled by indigenous peoples with reference to wind direction to allow

11. The World Bank, World Development Report 2021: Data for Better Lives, (Washington DC, World Bank Group, 2021).

12. Katie Thanda–Lake Eyre fills fully twice each hundred years but it partially fills far more frequently, as do the other dry lake beds of the interior: Encyclopedia Britannica, "Lake Eyre," last modified December 5, 2021, <https://www.britannica.com/place/Lake-Eyre>.

13. Vincent Serventy, The Desert Sea: The Miracle of Lake Eyre in Flood (Sydney: Macmillan, 1985).

14. Nature Conservancy of Australia. "10 Weird and Wonderful Wildlife of Australia." <https://www.natureaustralia.org.au/what-we-do/our-priorities/wildlife/wildlife-stories/10-weird-and-wonderful-wildlife-of-australia/#:~:text=More%20than%2080%25%20of%20our,the%20koala%2C%20platypus%20and%20echidna.>

15. Australian Biosecurity Cooperative Research Centre for Emerging Infectious Diseases, Delivering Benefits to Australia (Brisbane: Biosecurity Operation, 2010): 27.

16. Australian Biosecurity Cooperative Research Centre for Emerging Infectious Diseases, Delivering Benefits to Australia (Brisbane: Biosecurity Operation, 2010): 29.

17. Andrew C. Breed et al., "Bats Without Borders," *Ecohealth* 7 (2010): 204-212.

18. Bill Gammage, *The Biggest Estate on Earth: How Aborigines Made Australia*, (Crows Nest: Allen & Unwin Australia, 2012); Bruce Pascoe, *Dark Emu* (Broome: Magabala Books, 2019), 161-167.

animals to move safely from the areas to be burned. These ancient practices have recently been acknowledged by white Australian culture, adapted and termed cultural fire management, particularly after devastating wildfires took Australia by surprise in 2019. The summer of 2019-20 witnessed the worst bushfires in the history of Australia on the eastern coast of the country; the west coast burned in 2021. Human lives and homes were lost and an estimated three billion native vertebrate animals perished in 2019-20 alone, including 143 million mammals, 180 million birds, 51 million frogs, and 2.46 billion reptiles, (the latter living in much higher densities in the affected areas).¹⁹ As the bushfires affected enormous areas (estimated at 11.46 million hectares of mainly native vegetation), clearing of the dead animals or sanitation was largely left to nature. The Australian bush, forests, and deserts are home to a large population of cats, and there is some evidence that they targeted recently cleared areas for effective predation,²⁰ which is novel in terms of the sheer scale of hunting land and their interaction with injured animals.

Before the bushfires, koalas were already endangered by confinement to residual eucalypt forest conceded by development and termed green corridors, and endemic chlamydia associated with loss of habitat.²¹ The dwindling koala population was reduced by a further 30% in the fires and the preceding drought of 2017-19. One in three unique Australian mammals are now on the list of endangered species.²²

In a pattern that began long before the bushfires reached their recent intensity, the habitat of Australia's unique and iconic wildlife has been and continues to be destroyed to provide land for development but particularly for livestock grazing and feed production.²³ The destruction includes weed invasion following overgrazing, soil compaction and erosion due to the impact of livestock hooves and exclusion fencing to contain vertebrate 'pests' outside of livestock grazing areas.²⁴ Each year 20 hectares of native vegetation are being cleared each day in Western Australia to be used by the livestock industry,²⁵ while in Queensland the most recent daily figure is much higher, at 1,074 hectares in 2018.²⁶ No other industry, not even mining, has been as destructive to Australia's natural world, pushing black-flanked rock wallabies, Eastern Curlews, mountain pygmy possums and numbats, as well as koalas, as noted, to the brink of extinction.²⁷

19. World Wildlife Fund Australia, Annual Report 2020, 2020.

20. CSIRO, "Fighting Plagues and Predators: Australia's Path Toward a Pest and Weed-free Future," Centre for Invasive Species (2021): 10.

21. Bonnie L Quigley and Peter Timms, "Helping Koalas Battle Disease: Recent Advances in Chlamydia and Koala Retrovirus (KoRV) Disease Understanding and Treatment in Koalas," *FEMS Microbiology Reviews* 44, no.5 (2020): 583-605.

22. "Australia's Endangered Animals," The Nature Conservancy Australia, accessed September 15, 2023, <https://www.natureaustralia.org.au/what-we-do/our-priorities/wildlife/wildlife-stories/australias-endangered-animals/>.

23. Michelle S. Ward et al., "Lots of Loss with Little Scrutiny: The Attrition of Habitat Critical for Threatened Species in Australia," *Conservation Science and Practice* 1, no.11 (2019): e117, <https://doi.org/10.1111/csp2.117>

24. J. E. Williams and R. J. Price, "Impacts of Red Meat Production on Biodiversity in Australia: A Review and Comparison with Alternative Protein Production Industries," *Animal Production Science* 50, no. 8 (2010): 723–47, <https://doi.org/10.1071/AN09132>; M. H. Friedel, "Unwelcome Guests: A Selective History of Weed Introductions to Arid and Semi-arid Australia," *Australian Journal of Botany* 68 (2020): 75–99, <https://doi.org/10.1071/BT20030>; Deane Smith, Kristy Waddell, and Benjamin L. Allen, "Expansion of Vertebrate Pest Exclusion Fencing and Its Potential Benefits for Threatened Fauna Recovery in Australia," *Animals (Basel)* 10, no. 9 (2020): 1550, <https://doi.org/10.3390/ani10091550>.

25. Jane Hammond, "Cry of the Forests—A Western Australian Story: Official Trailer," YouTube, accessed September 15, 2023, <https://www.youtube.com/watch?v=iBuBDSR3nR0>.

26. William Owens and Georgia Robinson, "Australia's Deforestation Rates at an All-time High," *The Junction*, accessed September 15, 2023, <https://junctionjournalism.com/2019/09/20/australias-deforestation-rates-at-an-all-time-high/>.

27. "Australian Endangered Species List," *Australian Geographic*, June 17, 2014, <https://www.australiangeographic.com.au/topics/science-environment/2014/06/australian-endangered-species-list/>; Natasha Daly, "No, Koalas Aren't 'Functionally Extinct'—Yet," *National Geographic*, November 25, 2019, <https://www.nationalgeographic.com/animals/article/koalas-near-extinction-myth-australia-fires>; "Australia's Endangered Animals," The Nature Conservancy Australia, accessed September 15, 2023, <https://www.natureaustralia.org.au/what-we-do/our-priorities/wildlife/wildlife-stories/australias-endangered-animals/>; "10 Weird and Wonderful Wildlife of Australia," The Nature Conservancy Australia, accessed September 15, 2023, <https://www.natureaustralia.org.au/what-we-do/our-priorities/wildlife/wildlife-stories/10-weird-and-wonderful-wildlife-of-australia/>.

The degradation of the environment to supply grazing land promotes the interaction of species (including humans with other animal species) with greater frequency on partially cleared lands, as forests are fragmented, thinned or clear-felled and development expands. These interactions present a significant and increasing risk of zoonotic spillover.²⁸ While there is interest in environmental protection within the Australian community,²⁹ the public at large does not identify pastoral farming to be a cause of environmental degradation, as distinct from the extractive industries, which are more readily blamed for the problem. This is despite the fact that, in 2018, 93% of the land clearing in Australia, including the Great Barrier Reef catchment, was attributed to expanding beef production.³⁰ Nor is deforestation for agricultural purposes widely understood to pose a risk of zoonotic spillover. Australians conceive of farming as extensive or free range, and as such, as safe, as well as productive of positive animal welfare outcomes (despite occasional disruptions to this view³¹). In part, this is attributable to the deep roots of the colonial project and the almost mythic status of the farmer in Australian society. Since the early days of the development of the colonies, across almost all sectors of society agricultural activities were imbued with moral purpose. The production of wool and meat, and crops, promised economic stability and a stable social foundation. It “signified civilisation and colonial success”³² and also served to justify the oppression and denigration of indigenous communities. The increase in the population of wild horses known as brumbies in sub-alpine regions in New South Wales and Victoria is well known in Australia because brumbies have legendary cultural status.³³ Australia also has a large feral and farmed goat population.³⁴ However, relatively few Australians are conscious of the existence of a large “feral” camel population—the world’s largest³⁵—in the country’s interior. Still fewer Australians are aware of the widespread presence of the water buffalo (*Bubalus bubalis*) in the north, a species introduced in 1823. Numbers of buffalo were drastically reduced as part of the Brucellosis and Tuberculosis Eradication Campaign.³⁶ Since 1997, however, buffalo populations have again increased and in fact proliferated in the wetlands, woodlands and flood plains of Arnhem Land and other parts of northern Australia. Utilizing customary practices, indigenous communities in the South East Arnhem Land Indigenous Protected Area (SEAL IPA) use natural surface waters that they are increasingly forced to share with the buffalo in the dry season, and concerns about disease transmission has prompted recent scientific investigation

28. CSIRO, Strengthening Australia’s Pandemic Preparedness (Canberra: CSIRO, 2022), 4.

29. There is broad consensus that the result of the May 2022 federal election can be attributed in large part to the population’s concern about climate change. See, for example, Grant Wyeth, “The Forgotten, Quiet, Battlers: Who Are the Real Australians?” *The Diplomat*, June 7, 2022.

30. “Australian Beef & Deforestation Corporate Scorecard,” Wilderness Society, September 2019, <https://www.wilderness.org.au/images/resources/Beef-Deforestation-Scorecard-Report.pdf>.

31. Footage of the cruel nature of Australian cattle slaughter in Indonesia in 2011 resulted in over 60,000 media stories worldwide: Australian Broadcasting Corporation, “A Bloody Business,” *Four Corners*, <https://www.abc.net.au/4corners/4c-full-program-bloody-business/8961434>; Kara Tighe et al., “Does Consumer Interest in the Live Export Trade Affect Australian Meat Demand?” *Australasian Agribusiness Review* 27, Paper 8 (2019): 177–199, <https://cpb-ap-se2.wprmuccdn.com/blog.une.edu.au/dist/d/1339/files/2020/01/AAR-Vol-27-Paper-8-Tighe-et-al.pdf>. The Australian public responded emotionally, but the evidence of behavioural change was limited, with only 5% of those surveyed indicating that they had ceased to eat beef following viewing the exposé: C. M. Tiplady, D. B. Walsh, and C. J. C. Phillips, “Ethical Issues Concerning the Public Viewing of Media Broadcasts of Animal Cruelty,” *Journal of Agricultural and Environmental Ethics* 28 (2015): 635–645, <https://link.springer.com/article/10.1007/s10806-015-9547-x>.

32. George Main, *Heartland: The Regeneration of Rural Place* (Sydney: UNSW Press, 2005), 193–4.

33. Justin McManus and Finbar O’Mallon, “Ancient Rite, Modern Fight: How Brumbies are Breaking the Landscape,” *Sydney Morning Herald*, March 10, 2019.

34. In the past goats were exported by sea, and although there have been attempts to recommence this trade, export permits are generally not issued by the Australian Quarantine and Inspection Service: Scott Williams, “Preparation of Goats for Export,” *Meat & Livestock Australia*, 2009, https://www.mla.com.au/contentassets/e54ea9e5d7f64165aceb06f70a25a6b1/w.liv.0130_final_report.pdf. Goats are currently mainly exported by air from Australia to Malaysia and Singapore.

35. “Fighting Plagues and Predators: Australia’s Path Towards a Pest and Weed-free Future,” CSIRO (November 2021), 6.

36. The campaign began in the 1960s. In 1997 bovine tuberculosis was said to have been eradicated: Animal Health Australia, “Eradicating Bovine Tuberculosis from Australian Livestock,” *Tuberculosis Freedom Assurance Program, 2 Final Report* (2007), 1.

into the presence in the buffalo population of *Cryptosporidium* and *Giardia* (a cause of gastroenteritis in humans). While evidence of transmission of parasites through shared use of billabongs has not been established, *Giardia duodenalis* assemblage E, which appears to be an emerging zoonosis and which has been detected in farmed buffalo in the Australian State of Victoria (and in Italy), is present in the populations of water buffalo in the SEAL IPA and poses a risk of zoonotic transmission to humans.³⁷

Australians' relationships with animals and meat is complicated. There is some awareness that intensive farming of chickens and pigs in Australia involves practices that are cruel, but consumers largely accept the veracity of labels when they are marked humane or ethical even where there is a divergence between what producers and concerned consumers view to be ethical. Also, many Australians equate meat with red meat, such as lamb or beef, so fish and chicken are considered to be meat substitutes that are lighter and healthier than red meat³⁸ despite their animal sources. The acclaimed Australian novelist Richard Flanagan has recently exposed cruel and environmentally harmful practices within Tasmania's relatively new, though established, intensive salmon farming sector,³⁹ but salmon's popularity as a source of food is soaring.⁴⁰

Kangaroos are a traditional food source for Indigenous peoples. Compared to livestock, kangaroos are much better suited for the Australian environment. Anatomically, kangaroos have two long soft feet while sheep and cattle have four hard hooves that dig into and erode the fragile topsoil of the Australian continent.⁴¹ Kangaroos emit smaller quantities of methane than ruminant livestock.⁴² There are no wet markets where live kangaroos are sold, but packaged kangaroo meat is available in supermarkets, both as human and pet food. Local butchers and some restaurants also have kangaroo meat options. The meat itself has a low content of fat and more muscle; its flavour is strong. With growing awareness among the Australian population of the extensive land degradation caused by western agricultural practices, there have been numerous calls to reintroduce kangaroo meat from free-range harvesting of native species.⁴³ However, for some, the dominant perception about kangaroos is that they are wildlife and not a resource to be used for food; many farmers see them as agricultural pests. Across all Australian states and territories, kangaroos are regularly culled (or shot) to decrease and control their numbers. Several million kangaroos and wallabies (a smaller size marsupial) are commercially shot each year.⁴⁴ After kangaroos are killed in the wild, usually at night, they remain in the fields until collected by a truck after several hours, raising hygienic concerns about the presence of bacteria and pathogens in the meat.⁴⁵

37. Shaina Russell, Michelle Power, and Emilie Ens, "Cryptosporidium and Giardia in Feral Water Buffalo (*Bubalus bubalis*) in the South East Arnhem Land Indigenous Protected Area, Australia," *Parasitology Research* 119 (2020): 2149–57, <https://link.springer.com/article/10.1007/s00436-020-06703-6>.

38. Heather Bray and Rachel A. Ankeny, "It's Complicated: Australia's Relationship with Eating Meat," *The Conversation*, October 20, 2016, <https://theconversation.com/its-complicated-australias-relationship-with-eating-meat-67230>.

39. Richard Flanagan, *Toxic: The Rotting Underbelly of the Tasmanian Salmon Industry* (Penguin Random House Australia, 2021).

40. Autumn Swiers, "Salmon Prices in Australia are Getting out of Control," *Tasting Table*, July 27, 2022, <https://www.tastingtable.com/943062/salmon-prices-in-australia-are-getting-out-of-control/>.

41. Lynda Braddick, "Market Place Demand for Kangaroo Meat Consumption in Western Australia: A Sustainability Issue," unpublished Honours dissertation, Murdoch University, 2002.

42. Catharina Vendl et al., "Decreasing Methane Yield with Increasing Food Intake Keeps Daily Methane Emissions Constant in Two Foregut Fermenting Marsupials, the Western Grey Kangaroo and Red Kangaroo," *Journal of Experimental Biology* 218, part 21 (2015): 3425–34.

43. E.g., Lynda Braddick, "Market Place Demand for Kangaroo Meat Consumption in Western Australia: A Sustainability Issue," unpublished Honours dissertation, Murdoch University, 2002.

44. Jordan Sosnowski, "Kangaroo Culling in Australia," *Michigan State University College of Law*, 2013; Kris Descovich et al., "The Eastern Grey Kangaroo: Current Management and Future Directions," *Wildlife Research* 43, no. 7 (2016): 576–89.

45. "Kangaroo Factsheet 2017," *Viva!*, last updated May 2018, <https://viva.org.uk/materials/kangaroo-fact-sheet-2017/>.

Kangaroo numbers are declining in places such as New South Wales.⁴⁶ The shooting of kangaroos raises serious welfare concerns, as not all animals are killed instantly and the methods of slaughter of the surviving animals are contentious.⁴⁷ Large males are usually targeted, which can potentially decrease the available genetic pool.

REGULATORY BACKGROUND

Australia is a federal parliamentary constitutional monarchy under the monarch of the United Kingdom represented by the Governor-General.⁴⁸ The Commonwealth Constitution, adopted in 1901, established a federation of six states (New South Wales, Queensland, South Australia, Tasmania, Victoria, and Western Australia) and two mainland territories (Northern Territory and Australian Capital Territory), forming the Commonwealth of Australia.⁴⁹ Australia's Constitution establishes the federal Government in the tradition of the Westminster system. It has three branches of government: legislative, executive, and judicial. The legislature, the federal Parliament, is bicameral. The executive is led by the Prime Minister (the leader of the party or coalition with the majority of members in the Parliament) and Ministers are nominated by the Prime Minister. The Government is appointed by the Governor-General.⁵⁰ Within the upper house (Senate) is the Standing Committee for the Scrutiny of Delegated Legislation, which can initiate a parliamentary process to annul (disallow) regulations made by Ministers under statutory authority (or indeed, made outside of such authority). This has become an important check on executive power, as federal laws in recent decades increasingly take the form of delegated legislation (regulations), bypassing the legislature and its democratic processes. The legislature can disallow but does not scrutinise regulations when they are made, except through the work of the committee.

At the apex of the judicial branch of government is the High Court of Australia, beneath which federal courts operate within the geographical boundaries of all states and territories. Federal judges are appointed by the Governor-General on the advice of the Parliament.⁵¹

Each Australian state has its own constitution, parliament, government, independent courts, and laws.⁵² While territories are self-governing and have their own parliaments, courts, and government departments, they are direct creations of the federal Government with powers derived solely from the Commonwealth. States and territories are responsible for order and good governance, administering schools, hospitals and health services, transportation, utilities, emergency services, and police services within their borders.⁵³ A Governor is the constitutional head of each state representing Australia's monarch, to whom they are directly responsible.⁵⁴ In a system similar to the federal Government, Premiers and Chief Ministers lead the executive governments of Australian states and territories,

46. "Kangaroo Factsheet 2017," Viva!, last updated May 2018, <https://viva.org.uk/materials/kangaroo-fact-sheet-2017/V>

47. Kris Descovich et al., "The Eastern Grey Kangaroo: Current Management and Future Directions," *Wildlife Research* 43, no. 7 (2016): 576–89.

48. The Governor-General is also the Commander-in-Chief of the Australian Defence Force: The Governor-General of the Commonwealth of Australia, 2020.

49. Australia also has seven island territories and the Australian Antarctic Territory. They are governed according to federal law and the laws of each state. For example, the Cocos (Keeling) Islands are under Western Australia's governance.

50. Australian Prime Ministers, n.d.

51. Parliament of Australia, n.d.

52. Parliament of Australia, n.d.

53. Constitutional Centre, n.d.

54. They have constitutional responsibilities under the respective state/territory constitution and are not subject to the authority of the Governor-General.

respectively. Finally, local councils (led by a mayor or president) comprise the third level of government, represented by over 500 local councils, municipalities, or shires that produce by-laws.⁵⁵ These relate to building, planning, and the health and wellbeing of residents and delivery of services such as waste collection, libraries, and parking, and the maintenance of parks, gardens, and some roadways and bridges. Animal registration is part of local councils' responsibilities. The three levels of government—federal, state/territory, and local—work together to provide regulatory governance.

The main constitutional responsibilities of the Commonwealth relevant to present purposes are trade and commerce with other nations and among the states, and external affairs. Pursuant to the external affairs power, the Commonwealth exercises jurisdiction gained when Parliament ratifies international treaties or conventions, which together cover a wide range of subjects.

The Commonwealth is responsible for biosecurity and quarantine under the Constitution, but the states and territories are responsible for movement *within* their borders of goods of quarantine concern, as well as inter-state/territorial movement of goods.⁵⁶ Some powers, such as those relating to the natural environment and quarantine are shared (or concurrent) between the Commonwealth and the states. For example, the federal government is responsible for the implementation of treaties ratified by the Parliament, including international agreements on climate change and biodiversity, and takes responsibility for matters of national significance.⁵⁷ Nevertheless, protection of the environment, new developments, waste disposal, national parks, and water catchment systems, are the responsibility of the governments of states and territories. The Commonwealth is responsible for licensing and overseeing the export of food and food animals pursuant to its constitutional power to make laws for trade and commerce with other nations.

The Commonwealth shares with states and territories the power to regulate medicines for human and animal health, and poisons and chemicals used in agriculture and for other purposes. 90% of Australia's medicines are imported, which gives the Commonwealth legislative power, although its constitutional power to make laws for quarantine is also relevant. The Commonwealth has established two statutory authorities of critical importance, the Therapeutic Goods Administration and the Australian Pesticides and Veterinary Medicines Authority (APVMA), which evaluate, register, or authorize under permit all medicines used in human health, and agricultural and veterinary chemicals, respectively, before they can be made available for sale, supply, and use.⁵⁸ From the point of sale onward, state and territory governments are responsible for controlling and monitoring use. Medical and veterinary professionals, too, are regulated at the state and territory level, and codes of prescribing practice are issued, and data is collected, at the state and territory level. An intergovernmental agreement between the Commonwealth and the states and territories formalizes these arrangements.

Agriculture, including livestock production and forestry, to the extent that it occurs in a state or

55. In Western Australia these are local laws, not by-laws. Only the Australian Capital Territory is an exception to the three tiers of government, as its parliament governs areas elsewhere considered local government responsibilities.

56. Senate References Committee on Rural and Regional Affairs and Transport, *Australia's Biosecurity and Quarantine Arrangements* (Canberra: Commonwealth of Australia, 2012), 7.

57. According to the Australian Law Reform Commission, in 2015 there were 60 Commonwealth statutes related to the environment in force: cited in Australian Government Productivity Commission, *Regulation of Australian Agriculture: Productivity Commission Inquiry Report 79* (November 15, 2016): 109.

58. The Office of Chemical Safety of the Therapeutic Goods Administration issues import permits for antimicrobials. Veterinary medicines, including antimicrobials, are approved for use, and agricultural and veterinary products are registered for use by the Australian Pesticides and Veterinary Medicines Authority.

territory, legally falls within the responsibility of the Australian state and territory governments but the Commonwealth has adopted a coordinating role with respect to the codification of practices and setting standards in agriculture nationally, including with respect to animal husbandry. However, it is the states and territories, not the Commonwealth, who legislate to protect animals against cruel practices.

These circumstances can give rise to unhelpful anomalies. For example, although animal welfare statutes are made by each state and territory, a defense to a charge of committing an act of cruelty may be grounded in an accused's compliance with a national (Commonwealth) code of practice. While such codes cover farmed animals (a national matter), they do not cover animals that are kept as companions or used in sport, which are state and territory matters. It follows that an act which is cruel under state law if directed against a dog may be permitted against a pig, for example, if undertaken as part of a farming practice recognised by the Commonwealth, codified in one of its national documents and referred to in the state or territory Act as providing an available defense. This carve-out of jurisdiction with respect to the treatment of animals effectively subverts the purposes of the state and territory statutes for protection against cruelty by creating parallel standards. At the time of writing, a prosecution brought by the Western Australian Minister for Agriculture and Food against the notorious live animal exporter Emanuel Exports Pty Ltd is being heard by a Western Australian magistrate. The exporter's license had been suspended for breaches related to animal deaths on board on numerous occasions, but it has recently been renewed. The prosecution is a test case with the potential to define the limits of the conflict between the Commonwealth live export regime and the *Animal Welfare Act 2002* (WA). Ultimately, the High Court of Australia is the final arbiter of conflicts between state/territory laws and the laws of the Commonwealth.

In all states and one territory, there is a shared responsibility for the enforcement of cruelty to animal legislation between the state Royal Society for the Prevention of Cruelty to Animals (RSPCA) and state/territory governments. However, due to the assumption by the Commonwealth of its coordinating role to regulate farming practices, RSPCAs have very little involvement in law enforcement relating to farmed animals.

The key federal law enforcement institution, aside from the Australian Federal Police, is the Department of Home Affairs. It brings together federal law enforcement, national and transport security, criminal justice, emergency management, multicultural affairs, settlement services, and immigration and border-related functions.⁵⁹ The Commonwealth Attorney-General's Department oversees crime, corruption, and international legal relations. The state police and state courts have a degree of independence from the executive through their oversight by a Police Commissioner and Chief Justice, respectively.

BIOSECURITY AND THE CHALLENGE OF ANTIMICROBIAL RESISTANCE

Australia's biosecurity regime is world-renowned,⁶⁰ although it is not without its weaknesses. To date, Australia has enjoyed success in deflecting potential incursions of a number of zoonotic diseases

59. Department of Home Affairs, n.d.

60. CSIRO, Submission No 40 to the 2022 Rural and Regional Affairs and Transport Senate References Committee inquiry, p 4: https://www.aph.gov.au/Parliamentary_Business/Committees/Senate/Rural_and_Regional_Affairs_and_Transport/FMDBiosecurity.

of global significance, such as foot-and-mouth disease (FMD). A number of other common zoonoses, however, have prevailed. For example, pustular dermatitis (scabby mouth or orf) is a common viral disease in Australian sheep. Orf causes ulcers around the lips and nostrils and can markedly affect sheep welfare.⁶¹ Indeed, an early survey found that 23% of farms supplying the Australian live sheep export industry were infected with the disease.⁶² The fact that Australia is a continent is often cited as a natural advantage that gives its biosecurity efforts an edge; Australia builds on this advantage with strict quarantine measures supported by a national legal and administrative biosecurity regime, scrutiny of food imports, pest and pathogen surveillance systems, emergency animal disease and plant pest response strategies, research and development, and high security laboratories.⁶³ There have been numerous Commonwealth inquiries into the adequacy and efficacy of biosecurity over many years, including in the area of food safety.⁶⁴ Food produced in Australia is subject to a strong biosecurity regime, which is supervised by the Commonwealth Department of Agriculture, Fisheries and Forestry (DAFF)⁶⁵. Whether fees and government charges levied on industry in association with food safety are efficient and fair is a type of concern frequently raised in this area,⁶⁶ because although food safety challenges are ever-present and constantly evolving, regulation is not perceived as failing to safeguard the safety of food.⁶⁷ The World Trade Organization Agreement on the Application of Sanitary and Phytosanitary Measures requires Australia as a member nation to scrutinise agricultural import requests, which Australia does against the backdrop of its biosecurity and quarantine arrangements, and regulatory support is provided by the statutory authority, Food Standards Australia New Zealand.

Nevertheless, Australia's national science agency, the Commonwealth Science and Industrial Research Organisation (CSIRO), has reported that alarmingly, between 2012 and 2017, annual border interceptions of materials with biosecurity implications increased by almost 50%.⁶⁸ The Australian Biosecurity Cooperative Research Centre for Emerging Infectious Diseases (ABCRC) reports that between 1994 and 2010, there were more new zoonotic viruses identified in Australia than in any equivalent previous period.⁶⁹ Pathogens can circulate in livestock for significant periods of time before detection, as has been the case, for example, with the novel Middle Point orbivirus (MPOV) in the Northern Territory. MPOV was recently found in retrospective analysis to have been circulating undetected since 1995, and is now "widespread" in Australian cattle, in what the ABCRC has deemed to most likely represent "an incursion and dramatic expansion in the Australian environment" including

61. John Bryn Owen, *Sheep Production* (Amsterdam: Elsevier, 1976), 311.

62. A. R. Higgs et al., "Contagious Ecthyma in the Live Sheep Export Industry," *Australian Veterinary Journal* 74, no. 3 (1996): 215–20.

63. The Australian Centre for Disease Preparedness, previously known as the Australian Animal Health Laboratory, is Australia's primary Biosafety Level 4 laboratory. It is situated in Geelong, Victoria and it has operated since 1985.

64. See, for example, the Senate References Committee on Rural and Regional Affairs and Transport into Australia's biosecurity and quarantine arrangements (report dated April 2012); the Senate Environment and Communications References Committee inquiry into the adequacy of arrangements to prevent the entry and establishment of invasive species likely to harm Australia's environment (report dated 13 May 2015); and Productivity Commission, "Regulation of Australian Agriculture," chapter 8, "Biosecurity."

65. On July 1, 2022 the Department of Agriculture, Water and the Environment (DAWE) became the Department of Agriculture, Fisheries and Forestry (DAFF).

66. Senate Rural and Regional Affairs and Transport References Committee, "Australia's Biosecurity and Quarantine Arrangements," April 2012, 10.

67. The Food Safety Information Council in its June 2022 "Report Card" gives a mixed picture: "Australia's Food Safety Report Card Released for the UN World Food Safety Day 7 June 2022," Food Safety Information Council, June 7, 2022, <https://foodsafety.asn.au/topic/australias-food-safety-report-card-released-for-the-un-world-food-safety-day-7-june-2022/>.

68. CSIRO, "Australia's Biosecurity Future: Unlocking the Next Decade of Resilience (2020–2030)" (2020): 11.

69. Australian Biosecurity Cooperative Research Centre for Emerging Infectious Diseases, *Delivering Benefits to Australia* (Brisbane: Biosecurity Operation, 2010): 12.

amongst bats and crocodiles, the MPOV's putative hosts.⁷⁰ More than half of Australian farms produce cattle for beef,⁷¹ representing a total area of around 332 million hectares, or 43% of Australia's land mass. Most of this area is extremely remote and the availability of veterinary expertise is extremely limited,⁷² potentially contributing to delays before detection and under-reporting of disease events.⁷³

Internationally, Australia is considered to have a low antimicrobial resistance burden. A recent study, however, points to deficiencies in the data that underpin this conclusion.⁷⁴ These include the existence of surveillance blind spots and extrapolations from select numbers of studies without accounting for high geographical variability in the extent of presence of resistant pathogens. Authors of this recent study estimate Australian deaths per annum from infections with antimicrobial-resistant bacteria to be four times higher than an OECD, population-based model has estimated.⁷⁵

Another study, this time analysing meat purchased from supermarkets, has also produced results that diverge sharply from the official picture.⁷⁶ This survey found that, while its results did not exceed Food Standards Australia New Zealand residue specifications, of the Gram-negative bacteria tested for antimicrobial susceptibility in the meat and fish sampled, 55% of beef isolates and 39% of salmon isolates tested had potentially acquired resistance to a number of commonly used antibiotics. These included beta-lactams (for example, cefazolin, ceftazidime, ceftriaxone), tetracyclines (for example, tetracycline, tigecycline) and for an *Enterococcus* isolate, the fluoroquinolone ciprofloxacin.⁷⁷ Fluoroquinolones have never been registered for use in food animals in Australia, and based on the available data, the study's authors at Melbourne's Monash University were unable to draw conclusions as to the drivers of the resistance identified in their study. The Department of Agriculture, Water and the Environment (now DAFF) disputed that the findings reflect current practices in the salmon and beef sectors.⁷⁸ Yet whether the causes were antibiotic residues in the environment, or direct dosing of fish and animals, or some other means of contamination, is difficult to investigate in the absence of a nationally coordinated antimicrobial resistance surveillance program, which the Commonwealth Government has yet to institute.⁷⁹ Instead, national data continues to draw largely on "pilot and snapshot studies"⁸⁰ and

70. Australian Biosecurity Centre for Emerging Infectious Diseases, *Delivering for Australia*, (Brisbane: Biosecurity Operation, 2010): 105-6.

71. Australian Competition & Consumer Commission, *Cattle and Beef Market Study: Final Report*, March 2017, <https://www.accc.gov.au/system/files/ACCC%20Cattle%20and%20beef%20market%20studyFinal%20report.pdf>.

72. Australian Biosecurity Centre for Emerging Infectious Diseases, *Delivering for Australia* (Brisbane: Biosecurity Operation, 2010), 149; Australian Veterinary Association, *AVA Submission on the Commonwealth Government Employment White Paper*, November 2022, https://www.ava.com.au/globalassets/authors/ava-submission-on-employment-white-paper-final_221130.pdf.

73. Under-reporting of disease events in cattle has been identified by the Australian Biosecurity Centre for Emerging Infectious Diseases as a significant gap in national surveillance. "The main source of .. information is veterinary laboratories, but these sources have been declining... and provide virtually no information on the health status of livestock in the remote pastoral regions of northern Australia, which are the main supply areas of our beef exports": Australian Biosecurity Centre for Emerging Infectious Diseases, *Delivering for Australia* (Brisbane: Biosecurity Operation, 2010), 149.

74. Teresa M. Wozniak et al., "Disease Burden, Associated Mortality and Economic Impact of Antimicrobial Resistant Infections in Australia," *The Lancet Regional Health — Western Pacific* 27 (2022): 100521.

75. Teresa M. Wozniak et al., "Disease Burden, Associated Mortality and Economic Impact of Antimicrobial Resistant Infections in Australia," *The Lancet Regional Health — Western Pacific* 27 (2022): 100521; Organisation for Economic Cooperation and Development, *Stemming the Superbug Tide: Just A Few Dollars More*, OECD Health Policy Studies (Paris: OECD Publishing, 2018) <https://doi.org/10.1787/9789264307599-en>.

76. Monash University, *Centre to Impact AMR, Antimicrobial Resistance in Australian Supermarket Meats: Final Report*, Clayton, Victoria: 2022.

77. Monash University, *Centre to Impact AMR, Antimicrobial Resistance in Australian Supermarket Meats: Final Report*, Clayton, Victoria: 2022, 5.

78. DAWE quoted in Norman Swan, Alex McDonald and Alison Xiao, "Antibiotic Resistance Detected in the Food Chain Could Have Implications for Human Health, New Study Finds," ABC News, May 4, 2022, <https://www.abc.net.au/news/2022-05-04/antibiotic-resistance-study-agriculture-food-chain/101037200>.

79. For a history of the calls for improved surveillance that have been forthcoming since the 1980s, see Kerrie Tucker, *Culture of Resistance: Australia's Response to the Inappropriate Use of Antimicrobials*, Policy Brief No 46, The Australia Institute, February 2017, p 7-11.

80. Australian Pesticides and Veterinary Medicines Authority, *Antibiotic Resistance in Animals: A Report for the APVMA*, Canberra: 2017, p 12.

to focus on human use⁸¹ despite evidence of soil, water and other habitats harbouring bacteria with antibiotic resistance genes,⁸² and the identification of farm animals as possible reservoirs of resistance mechanisms.⁸³

Among farmed animals in Australia, antibiotics have predominantly been applied in intensive settings: in chicken, pig and salmon farming, and in feedlots. Indeed, a feedlot industry guideline describes 21 substances as “[c]ommonly used APVMA-approved antimicrobial agents used in feedlot cattle.”⁸⁴ While the livestock industry has voluntarily “agreed to only use medically unimportant antimicrobials as growth performance promoters,”⁸⁵ the question of what constitutes medical importance merits discussion.

Australia’s national list of importance rankings for antimicrobials⁸⁶ diverges in important respects from the rankings produced by the World Health Organization⁸⁷ including, in some instances, where resistance has already become widespread in Australia, and/or because an antibiotic is not used in human health in Australia.⁸⁸ Streptogramins, a class which includes the antibiotics virginiamycin and pristinamycin, are ranked as highly important by Australia and as highly important (though no longer critically important, which is the highest ranking) by the WHO. Virginiamycin continues to be ranked highly by Australia because pristinamycin is a reserve therapeutic agent in Australia for methicillin-resistant *Staphylococcus aureus*. Yet despite its high importance for human health, virginiamycin is approved for reasonably routine uses in Australian agriculture in intensive settings, subject to a veterinarian’s oversight. These include preventing acidosis in cattle when they convert from pasture to pellet feed in feedlots, and preventing necrotic enteritis in broiler chickens.⁸⁹

Similarly, while the third-generation cephalosporin Ceftiofur is ranked in the class of the highest priority antibiotics, this time by the WHO and Australia alike,⁹⁰ Ceftiofur is nevertheless available in Australia under a veterinarian’s prescription to treat respiratory conditions in cattle. While the antibiotic is not used in human health in Australia, it has the potential to select for cross resistance to antibiotics used in humans.

81. The first Antimicrobial Use and Resistance in Australia (AURA) reports, which comprehensively report on use in human health, were published in 2016: <https://www.amr.gov.au/resources>.

82. Ethan R. Wyrsh et al., “Urban Wildlife Crisis: Australian Silver Gull is a Bystander Host to Widespread Clinical Antibiotic Resistance,” *mSystems* 7, no 3 (2022):e00158-22, <https://doi.org/10.1128/msystems.00158-22>.

83. Hanna E. Sidjabat et al., “Multi-drug-resistant Gram-negative Bacteria,” *Microbiology Australia* 34, no. 1 (2013): 45.

84. Meat & Livestock Australia, Antimicrobial Stewardship Guidelines for the Australian Cattle Feedlot Industry, Australian Lot Feeders’ Association and Meat & Livestock Australia, Appendix 1 (March 2018): 14.

85. E. Doyle, J. Heller and J. M. Norris, “Factors Influencing Dairy Cattle Farmer Use of Antimicrobials on Farms in New South Wales, Australia,” *Australian Veterinary Journal*, September 29, 2022, 1, <https://doi.org/10.1111/avj.13209>.

86. Commonwealth of Australia, Importance Ratings and Summary of Antibacterial Uses in Human and Animal Health in Australia, Version 1.0 (2018).

87. World Health Organization, Critically Important Antimicrobials for Human Medicine, 6th revision (Geneva: World Health Organization, 2019).

88. In principle, country-specific divergences are not criticised but rather, are invited by the WHO: H. Morgan Scott et al., “Critically Important Antibiotics: Criteria and Approaches for Measuring and Reducing Their Use in Food Animal Agriculture,” *Annals of the New York Academy of Sciences*, Special Issue: Antimicrobial Resistance from Food Animal Production (2019): 10.

89. See label for “Eskalin™ 500 Feed Premix,” published on the APVMA Public Chemical Registration Information System (PUBCRIS) database at <https://portal.apvma.gov.au/pubcris>. See also APVMA, Findings of the Reconsideration of the Registration of Products Containing Virginiamycin, and their Labels (Kingston, ACT: 2004): 52. For an account of the registrant’s challenge before the Administrative Appeals Tribunal (AAT) to the APVMA’s 2004 findings on virginiamycin, see The Australia Institute, Culture of Resistance: Australia’s Response to the Inappropriate Use of Antimicrobials, Policy Brief No 46, February 2017, 28-29. The Department of Agriculture, Fisheries and Forestry advised a Parliamentary committee that as a consequence of the registrant’s legal challenge, it had paused its review of the use of macrolides in food animals which were then being used as growth promotants, since “a similar outcome would be expected”; Department of Agriculture, Fisheries and Forestry, Answers to Questions on Notice, Standing Committee on Finance and Public Administration Inquiry into the Progress in the implementation of the recommendations of the 1999 Joint Expert Technical Advisory Committee on Antibiotic Resistance, 20 March 2013, 2. Thirteen years after its review of virginiamycin, the APVMA withdrew approval of the use of macrolides as growth promotants, requiring veterinary oversight in accordance with new, approved label instructions: Macrolide Antibiotics (Kitsamycin, Oleandomycin and Tylosin) Regulatory Decisions, (Kingston ACT: 2017).

90. “Highest priority critically important” ranking, WHO, Critically Important Antimicrobials, 28; “highly important” ranking, Australia, Importance Ratings and Summary of Antibacterial Uses, 16.

Use categories cannot always be sharply delineated, despite the frequent tripartite categorization of antibiotics into use for growth promotion, prophylactic (or preventative), and therapeutic use.

In a report published by the APVMA, prophylactic use has been defined to mean “[a]dministering antimicrobial drugs to a single healthy animal known to be at risk due to, for example, it being in close proximity to other animals, or stress caused by transport or adverse weather conditions.”⁹¹ Therapeutic use is generally understood to mean treating an individual animal for an existing infection where clinical signs are present. Both therapeutic and prophylactic treatment are understood to take place under the direction of a veterinarian and are supposed to focus on individual treatment. In practice, however, a mix of therapeutic treatment and prophylaxis takes place on farms, such that a sick animal in a herd is given a higher, prescribed dose of a drug, while the herd is medicated concurrently prior to onset of “blatant” disease,⁹² with a lower dose. In 2004, the APMVA described this as “metaphylaxis”, and explained that it was common practice and represented “a blurring of the academic medical distinction between therapy and prophylaxis.”⁹³

A recent Australian study into the mass metaphylactic medication of pigs through drinking water found that farm managers and not veterinarians are in practice responsible for conducting metaphylactic dosing (based on a veterinarian’s prescription), and that despite the pivotal role of farm managers in antibiotic administration, “little is known about their choice and use of dosing equipment, the methods they use for making dosage calculations and preparing antibiotic stock solutions, ... [and] the frequency of administration of metaphylaxis.”⁹⁴

Available data on antibiotics in farmed animals fails to differentiate between prophylactic and therapeutic use because it is collected far from the end user. Chemical companies report total sales to the APVMA, without their data being connected to any use records that farmers are required to keep under Quality Assurance schemes and state and territory laws—nor is data systematically collected from or aligned with veterinary records. It is to be hoped that such shortcomings will be addressed when the Commonwealth acts on its commitment made in 2020 to “[c]reate a sustainably funded national One Health surveillance system that integrates human, animal, food and environmental usage and resistance data.”⁹⁵

OVERVIEW OF LIVE ANIMAL MARKETS

Horses, cattle, sheep, goats and camels are the primary animals sold in live markets in significant numbers in Australia.

91. Australian Pesticides and Veterinary Medicines Authority, *Antibiotic Resistance in Animals: A Report for the APVMA* (Canberra: 2017): 27 (Glossary).

92. Stephen Little et al., “In-Water Antibiotic Dosing Practices on Pig Farms,” *Antibiotics* 10, no. 2 (2021): 169, <https://doi.org/10.3390/antibiotics10020169>.

93. Australian Pesticides and Veterinary Medicines Authority, *Findings of the Reconsideration of the Registration of Products Containing Virginiamycin, and their Labels* (Kingston, ACT: 2004): 49.

94. Stephen Little et al., “In-Water Antibiotic Dosing Practices on Pig Farms,” *Antibiotics* 10, no. 2 (2021): 169, <https://doi.org/10.3390/antibiotics10020169>.

95. Commonwealth of Australia Department of Health and Department of Agriculture, Water and the Environment, *Australia’s National Antimicrobial Resistance Strategy – 2020 and Beyond* (Canberra: 2019) p 11, para 5.1.

Horses

About 300,000 people either fully or partially own a racehorse in Australia. In the State of Victoria, a gazetted public holiday takes place on the day of the Melbourne Cup race, and across the entire nation office workers and tradespeople enjoy a shorter working day or drinks at work on Melbourne Cup Day. There are 3600 registered trainers, 1000 jockeys and farriers and veterinarians associated with the industry. A total of 160,000 people are involved as employees, volunteers or participants.⁹⁶ There are almost 20,000 races each year, on around 400 tracks.⁹⁷

On Queensland's Gold Coast, a live thoroughbred racehorse auction known as the Magic Millions supplies an Ascot-style social event every year, and \$10 million in prize money. The large prize money for the very few top horses that do well in races promotes short lifespans for racehorses because breeders retire racehorses at a young age⁹⁸ to make way for new stock. Racing is controversial for reasons of horses' welfare. In addition, over the last decade the Australian racehorse industry has been regularly accused of race fixing, money laundering, tax fraud, and tipping.⁹⁹ Yet the sport remains beloved by many Australians.

Races and racehorse markets are subject to regulatory control at a state and territory level. Each jurisdiction has its own racing authority, which are constituents of a peak national body, Racing Australia. Australian Rules of Racing¹⁰⁰ are promulgated by Racing Australia. They do not have statutory force, but the Rules are enforced by the industry oversight bodies with due seriousness; gamblers dislike for others to gain unfair advantage, and perhaps this explains the impulse toward an even playing field in this sector. Among other matters, including anti-doping measures, the Rules make provision for traceability, fitness concerns and prohibitions on bringing horses with infectious diseases to racecourses.

Auctions for racehorses are often billed as carnivals. While COVID-19 lockdown rules prevented live sales at the beginning of the pandemic, at the time of this writing, major sales agents are conducting fortnightly auctions online but have also reinstated live auctions. Horses are brought to the racecourses several days before sale day where they are held until auction.

The Brisbane suburb of Hendra is a famous horse-racing locale. In 1949, there were 50 horse trainers registered to receive mail at its local post office. Today, the suburb retains its connection with horseracing due to its proximity to Eagle Farm, an adjacent suburb that is home to Queensland's premier racetrack. In 1994 a racing stable in Hendra was the eponymous location of a spillover event of a zoonotic pathogen, the virus now known as HeV. A horse trainer caring for a sick horse who was exposed to its bodily fluids was himself fatally infected with HeV at the Hendra stable after this close contact with the dying horse.¹⁰¹

96. Racing Australia, Annual Report, 2020, <http://publishingservices.racingaustralia.horse/otherpublications/AnnualReport2020/6/>.

97. Caulfield, 2018, p 243

98. According to a recent industry report, the median retirement age is 5 years. For destinations post-retirement and reasons for retirement, see Meredith Flash et al., "Australian Thoroughbreds from Racing to Retirement," *AgriFutures, Thoroughbred Horses*, December 2021, <https://agrifutures.com.au/product/australian-thoroughbreds-from-racing-to-retirement/>.

99. "Gangs and Corruption in Australian Horse Racing," *Play the Game*, August 12, 2012, <https://www.playthegame.org/news/gangs-and-corruption-in-australian-horse-racing/>; Kristin, "The Racing Industry's Darkest Secret Exposed," *Coalition for the Protection of Racehorses*, October 17, 2019, <https://horseracingkills.com/2019/10/17/the-racing-industrys-darkest-secret-exposed/>.

100. Available at https://www.racingaustralia.horse/FreeServices/Australian_Rules_Of_Racing.aspx.

101. Subsequent human fatalities have been attributed to infection during autopsies (and an endoscopy) performed on horses infected with the virus. Queensland Ombudsman, *The Hendra Virus Report*, November 2011, 36, https://www.ombudsman.qld.gov.au/ArticleDocuments/228/Hendra_Virus_Report.pdf.aspx?Embed=Y.

HeV is highly lethal in horses and humans,¹⁰² but there is no known human-to-human transmission. The virus is not considered to be highly contagious, passing with difficulty from horse to human. It is now known that its primary hosts are the four mainland Australian species of flying foxes (bats): the black flying fox (*Pteropus alecto*), little red flying fox (*P. scapulatus*), spectacled flying fox (*P. conspicilatus*), and the grey-headed flying fox (*P. poliocephalus*). It is hypothesised that “flying foxes colonized Australia as a result of the emergence of eucalypts as a dominant plant species.”¹⁰³ Today, there are approximately 1.2 million flying foxes on the continent¹⁰⁴ and their distribution has changed over time with introduced species of food plants and rising temperatures. Flying foxes were traditionally nomadic across unbroken eucalypt forest along Australia’s eastern coast¹⁰⁵ which has now fragmented due to deforestation. At the same time, incidence of interactions with farmed animals and humans has increased as Australians in larger numbers have been moving to urban fringes zoned for non-urban land use, characterised by larger lot sizes and far lower population density than found in urban areas.¹⁰⁶ Flying foxes are prolific eaters, feeding on fruits and blossoms, and ingesting up to two-and-a-half times their body weight in plant matter each night.¹⁰⁷ It is typical for a flying fox to bite off a ripe fig weighing up to 15 grams from a branch and carry it up to 50 metres from the tree to perch and consume it,¹⁰⁸ dropping its seeds away from the parent tree and often leaving partly eaten fruit coated in its saliva on the ground. Indeed, transmission of the virus from bat to horse is thought to occur through bat urine (or faeces) consumed by horses feeding in proximity to roosts, or via bat saliva ingested when a horse consumes partly eaten fruit.

Within one month of the 1994 event in Hendra, another HeV infection was reported 800 kilometres to the north of Hendra in Mackay, Queensland, sparking a search for an animal species present in Brisbane and Mackay that could travel the long distance between them. The little red flying fox was known to cross distances of this magnitude,¹⁰⁹ and blood samples were taken of all four mainland species. Approximately 14% were found to carry HeV antibodies.¹¹⁰ HeV is now known to be endemic to the geographical range of all four flying foxes. Two to three percent of bats were found to have active viral RNA at any one time, though it is believed that 40%-50% of bats, depending on the species,

102. As at January 2022, the case fatality rate in horses is 75%, with 84 recorded deaths. The case fatality rate in humans is 57%, with four deaths: Peggy Eby et al., “Pathogen Spillover Driven by Rapid Changes in Bat Ecology,” *Nature* 613 (2023): 340–344, <https://doi.org/10.1038/s41586-022-05506-2>.

103. Leslie S. Hall and Gregory Richards, *Flying Foxes: Fruit and Blossom Bats of Australia*, (Malabar, FL: Krieger Publishing Company, 2000), 20.

104. Already declining numbers have declined further due to deaths from smoke from bushfires and rising temperatures that cause mass deaths from heat stress. This figure is a rough estimate drawn from 2018 and 2019 data from the National Flying-Fox Monitoring Program that covers only part of the geographical ranges of the black and little red flying foxes. A recent study comparing drone-based counting methods to the ground counting method used by the CSIRO also suggests that the number is an underestimate: CSIRO, *The National Flying-fox Monitoring Program: Report on the November 2019 Survey*, <https://www.dcceew.gov.au/sites/default/files/env/pages/391f5fed-e287-4dd3-85ac-640037926ef5/files/flying-fox-nov2019-count-report.pdf>; Eliane D. McCarthy et al., “Ground-based Counting Methods Underestimate True Numbers of a Threatened Colonial Mammal: An Evaluation Using Drone-based Thermal Surveys as a Reference,” *Wildlife Research* 50, no. 6 (2023): 484–93, <https://www.publish.csiro.au/WR/pdf/WR21120>.

105. Rosemary McFarlane, Niels Becker, and Hume Field, “Investigation of the Climatic and Environmental Context of Hendra Virus Spillover Events 1994–2010,” *PLoS One* 6, no. 12 (2011): e28374, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3228733/>.

106. H. Aslin and Valerie Brown, *Towards Whole of Community Engagement: A Practical Toolkit* (Canberra: ANU Research Publications, 2004): 44. A 2011 investigation into causes of HeV spillover observed in all but two event sites trends of increasing human population between 1991 and 2006, but noted that increase in horse density was not a factor (although proximity of grazing horses to bat roosts was observed): Rosemary McFarlane, Niels Becker, and Hume Field, “Investigation of the Climatic and Environmental Context of Hendra Virus Spillover Events 1994–2010,” *PLoS One* 6, no. 12 (2011): e28374, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3228733/>.

107. Leslie S. Hall and Gregory Richards, *Flying Foxes: Fruit and Blossom Bats of Australia*, (Malabar, FL: Krieger Publishing Company, 2000), 70.

108. Leslie S. Hall and Gregory Richards, *Flying Foxes: Fruit and Blossom Bats of Australia*, (Malabar, FL: Krieger Publishing Company, 2000), 71.

109. See also Breed et al., “Bats Without Borders: Long-Distance Movements and Implications for Disease Risk Management,” *Ecohealth* 7, no. 2 (2010): 204–12 as to the significant range of *P. alecto*.

110. Leslie S. Hall and Gregory Richards, *Flying Foxes: Fruit and Blossom Bats of Australia*, (Malabar, FL: Krieger Publishing Company, 2000), 55-6.

possess antibodies indicating previous exposure.¹¹¹ A variant of HeV has recently been found in a large, retrospective analysis of horse infections where PCR testing at the time of infection had not detected the original virus. The study highlights that a greater genetic diversity of the virus than previously recognised is circulating among flying foxes.¹¹²

On July 12, 2022, a new case of Hendra was detected in Mackay, Queensland, the first case since October, 2021.¹¹³ While a vaccine developed in 2012 is considered to have reduced the number of spillover events significantly, it has been hypothesized that severely burned trees due to the recent bushfires and the La Niña phase of the El-Niño Southern Oscillation cycle that is currently affecting the Australian continent are causing food shortages for flying foxes and may be contributing to an increase in zoonotic spillovers in eastern Australia.¹¹⁴ Indeed, an important study specifically links bats' behavioral and immunological responses to environmental change with a predictable increase in spillovers.¹¹⁵ The authors of this study have analyzed 25 years of data of land-change use in subtropical Australia, bat behavior, and spillover events to conclude that nutritional stress caused by land clearing and the El Nino phase that preceded the current La Nina, together with the (unpredictable) failure of *Eucalyptus* species in remnant forests to flower in winter, have caused food shortages that have in turn triggered behavioral and physiological responses in black flying foxes that were initially transient behaviours but that have become persistent. Influenced by such stressors, bats typically split into smaller roosts, are often forced into urban gardens or fringe agricultural areas where the food sources are sub-optimal but available, and as a result of physiological stress, tend to excrete pathogens in greater concentrations. The authors posit that an “extensive program of ecological protection and restoration of winter-flowering forests” could be one “ecological countermeasure” that in the long term could reduce the number of spillover events.¹¹⁶

Before the COVID-19 pandemic, horses for recreational use were sold privately but sometimes in saleyards where physical inspection was possible. Likewise, sales of racehorses for re-homing or rescue and sales of horses destined for slaughterhouses sometimes took place in saleyards. As of the time of writing, these sales now take place privately or wholly online. Unlike the carnival-style racehorse auctions, there are no indications at the time of writing that physical sale days for these horses will be revived.

Racehorse auctions have tended to be postponed when there is an alert due to a Hendra infection, despite 5-meter distancing rules imposed by state agricultural departments.¹¹⁷ With individual horses sometimes valued at half a million dollars, the rationale for caution is clear.

111. Australian Biosecurity Centre for Emerging Infectious Diseases, Delivering for Australia (Brisbane: Biosecurity Operation, 2010), 59.

112. Edward J. Annand et al., “Novel Hendra Virus Variant Detected by Sentinel Surveillance of Horses in Australia,” *Emerging Infectious Diseases* 28, no. 3 (2022): 693-704.

113. “Summary of Hendra Virus Incidents in Horses,” *Business Queensland*, Queensland Government, last updated July 12, 2022, <https://www.business.qld.gov.au/industries/service-industries-professionals/service-industries/veterinary-surgeons/guidelines-hendra/incident-summary>.

114. P. Eby et al., “Conditions Predict Heightened Hendra Virus Spillover Risk in Horses This Winter: Actions Now Can Change Outcomes,” *Australian Veterinary Journal* 98, no. 6 (2020): 270–271.

115. Peggy Eby et al., “Pathogen Spillover Driven by Rapid Changes in Bat Ecology,” *Nature* 613 (2022): 340–4, <https://doi.org/10.1038/s41586-022-05506-2>.

116. Peggy Eby et al., “Pathogen Spillover Driven by Rapid Changes in Bat Ecology,” *Nature* 613 (2022): 340–4. Footnote omitted.

117. Miranda Saunders, “Hendra Virus Postpones Horse Sale,” *ABC Rural*, last updated July 5, 2011, <https://www.abc.net.au/news/rural/2011-07-05/hendra-virus-postpones-horse-sale/6183686>.

Farm Animals: Domestic

In Australia, cattle predominate in the north, and sheep and cattle are the dominant species of livestock bred in the south. Farmers in the northern regions of Australia and the southern largely produce different breeds of cattle because of the differences in terrain, climate and markets. In the central regions, livestock stocking densities are very low. Sheep farms are increasingly being replaced by cattle farms in the south, and the sheep industry is in long-term decline as a result of low wool prices in competition with synthetics. Numerically, most farms in Australia are small, but they range from family-owned and operated businesses to vast properties managed by powerful agricultural corporations. In the case of peri-urban, or so-called hobby or lifestyle farmers, a growing group associated with an aging population, off-farm income can exceed the on-farm income.¹¹⁸ The largest 10% of agribusinesses operating in Australia (with receipts greater than \$1 million) account for approximately 50% of farm output, while the smallest 50% of farms, with receipts less than \$200,000, account for about 15%.¹¹⁹ Annually, about 19 million sheep and 6 million cattle are sold.

Saleyards are the most important live animal markets in Australia. They are physical markets where buyers and sellers trade livestock at auction.¹²⁰ Mostly, saleyards are used by small scale producers, including hobby-farmers; it is the large producers that most often sell directly to abattoirs,¹²¹ or direct to live exporters or other farmers in private sales. In vertically integrated agribusinesses producers will slaughter their own animals, bypassing saleyards. The proportion of animals sold direct to slaughterhouses and to saleyards respectively varies by region, weather, and market factors,¹²² but, for example, in the Central Western region of New South Wales, typically 30%-40% of all lambs go to slaughterhouses and the remainder are sold at auction in saleyards.¹²³ In 2021, a total of 3,545,775 cattle and 13,434,689 sheep were sold in saleyards throughout the country.¹²⁴

In preparation for sale, cattle and sheep are mustered in the fields by stock people on motorbikes and horses and in vehicles, airplanes, and helicopters. An initial muster of rangelands by air is usually followed up with on-the-ground mustering. Poultry are collected by catchers or mechanized harvesting. Cattle and sheep are then transported to their buyer by road, mostly in articulated trucks.¹²⁵ Horses, pigs, poultry, alpacas, goats, camels, emus, and buffalo are among the other approximately 970 million animals transported by road annually across Australia. Indeed, animals in Australia are regularly transported across vast distances, sometimes thousands of kilometers, in trucks.¹²⁶

118. H. Aslin and Valerie Brown, *Towards Whole of Community Engagement: A Practical Toolkit* (Canberra: ANU Research Publications, 2004): 6, 19, 44; Australian Biosecurity Centre for Emerging Infectious Diseases, *Delivering for Australia* (Brisbane: Biosecurity Operation, 2010).

119. Australian Government Productivity Commission, *Regulation of Australian Agriculture: Productivity Commission Inquiry Report 79* (November 15, 2016): 49.

120. Australian Competition & Consumer Commission, *Cattle and Beef Market Study: Final Report*, March 2017, <https://www.accc.gov.au/system/files/ACCC%20Cattle%20and%20beef%20market%20studyFinal%20report.pdf>.

121. Australian Competition & Consumer Commission, *Cattle and Beef Market Study: Final Report*, March 2017, <https://www.accc.gov.au/system/files/ACCC%20Cattle%20and%20beef%20market%20studyFinal%20report.pdf>.

122. Major buyers make decisions seasonally to purchase meat products direct from processors: Mark Griggs, "Coles, Woolies Avoid Dubbo Saleyards," *Farm Online National*, updated December 23, 2015, <https://www.farmonline.com.au/story/3606883/coles-woolies-avoid-dubbo-saleyards/>.

123. Kristen Frost, "Slaughter Levels for Sheep and Goats Reach Unseasonable Highs," *Farm Online National*, updated September 28, 2022, <https://www.farmonline.com.au/story/7916054/sheep-goat-slaughter-levels-continue-to-rise/>.

124. Meat and Livestock Australia, *National Livestock Reporting Service: Saleyard Survey 2020–21, 2022*, <https://www.mla.com.au/contentassets/435cfb49268947dc817e5f57593b041a/2020-2021-saleyard-survey.pdf>. There are no saleyards operating in the territories, only within the Australian states.

125. Australian Government Productivity Commission, *Regulation of Australian Agriculture: Productivity Commission Inquiry Report 79* (November 15, 2016): 347; Queensland Government, 2022.

126. Australian Government Productivity Commission, *Regulation of Australian Agriculture: Productivity Commission Inquiry Report 79* (November 15, 2016): 346; CSIRO, "Livestock Logistics," accessed September 9, 2023, <https://www.csiro.au/en/research/animals/livestock/livestock-logistics>.

The regions differ sharply with respect to the distances that animals typically need to travel to reach their next destination. In the south, even though the distances traversed remain extremely large, relative to the north they are not as great. Most slaughterhouses take cattle from within a 400-kilometer radius of the point of sale. However, slaughterhouses are almost entirely absent from the north, with slaughterhouses and saleyards along Queensland's long eastern coastline sometimes being the nearest destinations for Northern Territory livestock as well as those farmed in Queensland's vast inland and northern country.¹²⁷ Trucks loaded with livestock also routinely cross the border between South Australia and Victoria, and animals are trucked right across the Nullarbor Plain. Animals also travel equally long distances in trucks to buyers' destinations to enable farms to restock after entire herds have been killed in floods,¹²⁸ or depleted due to drought. These sales are often managed privately or through an agent.

When animals are transported from a farm, they are exposed to stressors, primarily group stresses, isolation, motion stress, environmental change, human interactions, and denial of feed and water so as to prevent animals from generating large quantities of excreta within the vehicle. As well as creating close proximity to conspecifics, transport increases the risk of infectious disease acquisition from other animal species, particularly those that are exposed to the same stresses. Stressed animals come into contact at farmers' markets and saleyards as well as on the properties where they are rehomed (if sale is not direct to the slaughterhouse).¹²⁹ For intersecting reasons of biosecurity and welfare, the transportation of livestock is specifically regulated. With some variations, the *Australian Animal Welfare Standards and Guidelines — Land Transport of Livestock* (Land Transport Standards and Guidelines) have legislative force in the states and territories.¹³⁰ These specify that the consignor has a legal duty to ensure the welfare of the animals to be transported — in particular, through the inspection and selection of livestock as “fit for the intended journey.” The consignor is also responsible for the animals' welfare while they are held in any yard prior to loading, including by providing water, feed, and in some circumstances, shelter. The consignor would usually be the owner/selling party (at the ‘farm gate’), but might be an agent, or a representative of the saleyard manager. In law, the “transporter,” or driver, is jointly responsible with the consignor for loading the animals, though the driver is wholly responsible for the animals' welfare during the journey. This responsibility involves inspecting the animals and spelling them (that is, providing them with space to lie down and rest, and with food and water). Standards 4.1—4.5 include the stipulation that if an animal suffers from a condition that is likely to cause increased pain or distress during transport, it is not fit to make the journey. Standard 4.3 provides that “[t]he consignor must only supply animals that are fit for the intended journey.” This concept of fitness for transportation is

127. Australian Government Productivity Commission, Regulation of Australian Agriculture: Productivity Commission Inquiry Report 79 (November 15, 2016): 351. In contrast, poultry are usually not marketed at the end of life but are transferred internally in major companies from the growing/laying shed to the company's poultry processing factory. These internal slaughterhouses are usually close (within 10 km) to the growing factories. There are about 379 processing factories nationwide, employing 18,421 staff. Abattoirs where pigs are killed also tend to be in closer proximity to piggeries.

128. Heath Cook, “Long Road to Recovery for Dairy Farmers After NSW and Queensland Floods,” Farm Online National, updated July 4, 2022, <https://www.farmonline.com.au/story/7720733/long-road-to-recovery-for-dairy-sector-after-floods/>.

129. Australian Biosecurity Centre for Emerging Infectious Diseases, Delivering for Australia (Brisbane: Biosecurity Operation, 2010). A key gap identified prior to the establishment of the ABCRC was the lack of knowledge about biosecurity risk associated with small-scale and/or non-commercial producers. According to the ABCRC, livestock belonging to small landholders including hobby farmers have been identified as a biosecurity risk, providing a potential “channel for disease transmission and dissemination to commercial livestock” with which they mingle at saleyards.

130. Animal Health Australia, Australian Animal Welfare Standards and Guidelines — Land Transport of Livestock, (Canberra: Animal Health Australia, 2012): v 1.1, <http://animalwelfarestandards.net.au/wp-content/uploads/2023/08/Land-transport-of-livestock-Standards-and-Guidelines-Version-1-1-21-September-2012.pdf>. For the manner in which the Standards achieve legal force in each state and territory and to access the text, see “Land Transport – Progress Report,” Australian Animal Welfare Standards and Guidelines, last modified December 2020, <https://www.animalwelfarestandards.net.au/land-transport/>. Animal transport is also affected by regulations that govern the operation of heavy vehicles, roads, animal welfare and export slaughterhouses, and regulation spans all three tiers of government: Australian Government Productivity Commission, Regulation of Australian Agriculture: Productivity Commission Inquiry Report 79 (November 15, 2016): 347.

reinforced in an oft-cited industry guideline, “Is the animal fit to load?”¹³¹ The Land Transport Standards and Guidelines also set out minimum durations for animals to be spelled following maximum allowable periods of keeping animals of different species and different ages “off water.” These allow cattle and sheep to be deprived of water in transport for up to 48 hours, after which time they must be spelled for a 36-hour period. The period of deprivation for pigs and poultry is 24 hours.¹³²

Until recently, there has been limited visibility into the actual experience of animals being transported. To be sure, over many years Australian representatives of a nongovernmental organization (NGO) we consulted with have witnessed the highly variable conditions of animals in the pens of saleyards and farmers’ markets, including animals that are lame being offered for sale. There is no national authority, however, that conducts random inspections of animal transport. Certainly, it is not clear that spelling, even after journeys that last more than two days, always in fact occurs. In one reported instance, sheep being transported by truck were estimated to have been denied water for over 72 hours on a 2,500-km-long, interstate journey.¹³³ Further, sheep in saleyards have been observed to exhibit a range of conditions including exhaustion caused by lack of water and feed, visible cancerous growths, swollen hernias, pus-filled infection of the prepuce (balanoposthitis), abscesses, and mouth lesions, which indicate that although they have been delivered to the saleyard, they cannot be sold there because they are unfit to be reloaded into transport to depart from the premises. Despite improvements in some locations, the conditions of animals observed over time at saleyards and markets by the aforementioned NGO has borne the inference that there is widespread noncompliance with animal welfare standards at the point of origin, that is, at the farm gate. In September 2022, this inference was corroborated by 631 animal welfare incident reports involving thousands of animals comprising over 8,000 pages of documentation made over a two-year period, which the Minister for Agriculture, Fisheries, Forestry and Emergency Management tabled in Parliament at the request of another Senator and in compliance with an order of the Senate.¹³⁴

Slaughterhouses licensed to produce meat for export fall within the jurisdiction of the Commonwealth and operators are required to lodge incident reports with DAFF as well as with the relevant state or territory government department when an animal presents with a condition that gives rise to a welfare concern. The Land Transport Standards and Guidelines apply not only to animals destined for slaughter at a facility producing meat for export, but to all livestock transported by land, whether to saleyards, slaughterhouses that produce meat for the domestic market, to farmers’ markets, or across the country to a private buyer. Along with the fact that compliance is never total, the fact that the coverage of the incident reports tabled in Parliament was limited to export slaughterhouses suggests that the reports reflect a smaller number of welfare incidents than actually takes place.¹³⁵ The

131. “Is the Animal Fit to Load,” Meat and Livestock Australia, Revised Edition September 2019, National Version, [m la.com.au/isitfittoload](http://mla.com.au/isitfittoload).

132. Animal Health Australia, Australian Animal Welfare Standards and Guidelines — Land Transport of Livestock, (Canberra: Animal Health Australia, 2012): v 1.1, SB4.1, SB4.2 (cattle); SB 11.1 (sheep); SB9.1, SB9.3, GB9.4 (pigs); SB10.1 (poultry), <http://animalwelfarestandards.net.au/wp-content/uploads/2023/08/Land-transport-of-livestock-Standards-and-Guidelines-Version-1.-1-21-September-2012.pdf>.

133. This estimate takes account of prior water deprivation on the farm in a yard before transportation: Dawn Lowe and Peter Kerkenezov, *Farmed Animal Welfare: A Report*, (Frankfurt: Animal Angels’ Press, 2012), 14.

134. Response, tabled September 15, 2022, to Senate Order No 1304 made February 9, 2022, available at https://www.apf.gov.au/Parliamentary_Business/Tabled_Documents/297. The 631 incidents involved 4083 animals.

135. There is debate as to how widespread such incidents are: Terry Sim, “Animal Welfare Incidents Prompt Call for Industry Reforms,” Beef Central, September 22, 2022, accessed November 15, 2022, <https://www.beefcentral.com/news/animal-welfare-incidents-prompt-call-for-industry-reforms/>.

incident reports supplied excluded any detail pertaining to 64 additional reports on the basis that they are currently under investigation by states and territory agencies. Presumably, those reports represent more serious breaches of welfare standards than outlined in the tabled bundle. Yet those contained in the reports tabled by the Minister are sufficiently serious. Calculations based on a report of 480 sheep loaded across six decks of a truck, of which five were unable to walk off the truck at the saleyard and, exhausted, were euthanized, suggest that the sheep had been kept for 66.5 hours without feed.¹³⁶ The reports also record clear cases of mistreatment and cruelty in the interactions of humans and dogs with livestock.

In response to the publication of the bundle, a number of industry representatives have publicly condemned the practices recorded.¹³⁷ While qualifying its statement with the assertion that the cases demonstrated the regulators were doing their job by detecting the infractions, the Australian Meat Industry Council stated that they involved breaches of fit to load guidelines where “animals should never have left the property, or saleyard, of origin”.¹³⁸

Farmers’ Markets

Farmers’ markets (hereafter “markets”) differ from saleyards in that live animals are but one of the many commodities traded. These items might include fresh produce, farm tools, honey, plants, and sometimes food for immediate consumption sold out of food trucks on the premises. Like saleyards, they are found throughout the country. They typically take place on local council land. As a rule, large producers do not use markets to sell their animals; instead, they are popular with hobby farmers and other small producers, and with operators of medium-sized farms who have animals in small numbers to dispose of, left over from their established contractual relationships.

For this reason, markets pose special risks. According to the Australian Biosecurity Cooperative Research Centre for Emerging Infectious Diseases (ABCRC), hobby farmers are less likely to be conscious of biosecurity. Producers with small herds are less likely to notice or report disease in their animals, and more likely to use private sale channels, such as selling to a neighbor or domestic slaughterhouse, or a market or saleyard.¹³⁹

Different animal species can be found in close proximity on market premises, although not within pens. At a typical market, there may be pigs in a pigpen, birds in cages, and sheep in a pen, but sheep and pigs will be ordinarily kept in separate pens though their pens might adjoin. For example, at the Gawler market in South Australia, rows of poultry can be found side by side with sheep.

Veterinarians are not on hand at markets and there are no veterinary inspections for identifying sick animals. Indeed, ailing animals may be taken to the market precisely because they are sick, in the hope that the buyer will not notice.¹⁴⁰ While numerically far fewer animals pass through markets

136. Report No 1801, p 5370.

137. See, for example, comments by the independent chair of the Red Meat Advisory Council, John McKillop, quoted in Terry Sim, “Animal Welfare Incidents Prompt Call for Industry Reforms,” *Beef Central*, September 22, 2022, accessed November 15, 2022, <https://www.beefcentral.com/news/animal-welfare-incidents-prompt-call-for-industry-reforms/>.

138. Australian Meat Industry Council, “Statement on Animal Welfare Incident Reports Tabled in Senate,” Media Statement, September 15, 2022, accessed November 29, 2022, <https://www.sheepcentral.com/wp-content/uploads/2022/09/15092022-Media-Statement-Livestock-Welfare-Report-2.pdf>.

139. Australian Biosecurity Centre for Emerging Infectious Diseases, *Delivering for Australia* (Brisbane: Biosecurity Operation, 2010), 164.

140. Dawn Lowe, personal communication, August 10, 2022.

than through saleyards, the risks at markets are heightened by their informal character and the greater potential that injured or sick animals will be sold instead of treated or humanely destroyed as required under saleyard regulations.

Pathogens mix well within pigs. They are amplifying hosts for Japanese encephalitis and foot and mouth disease (FMD). The Food and Agriculture Organization of the United Nations has estimated that in their exhalations, pigs liberate approximately 3,000 times the quantity of the Aphthovirus that causes FMD as do cattle¹⁴¹ with infections spreading rapidly in this manner among pigs. Japanese encephalitis (JEV) is another virus with pandemic potential. It is an arboviral disease¹⁴² that has had an uptick in incidence in human infections in Australia in 2022.¹⁴³ Pigs are also hosts for pestiviruses, which are the cause of classical swine fever and other important diseases. In 2004, a new pestivirus was found in piglets in Australia, the Bungowannah virus, which causes porcine myocarditis.¹⁴⁴ The Nipah virus (NiV), related to the Hendra virus, spread through the movement of infected pigs throughout Malaysia and into Singapore in 1999.¹⁴⁵ As MacLean and Graham record, flying foxes that roosted in the vicinity of pig barns transmitted the virus to pigs, in whom the virus was amplified and spread to humans.¹⁴⁶

Avian influenza is among the pathogens of concern in Australia in the context of hobby farming of fowl,¹⁴⁷ and although the H5N1 and H7N9 strains of the A virus have not been found to date, phylogenetic analysis of viruses following an outbreak of respiratory infections in pigs in Western Australian in 2012 revealed that a previously unknown influenza A virus with human origin genes not seen in several decades had been circulating and evolving within the Western Australian pig population undetected.¹⁴⁸

As with pigs, poultry are primarily offered for sale at markets by hobby farmers who may have very small flocks while larger producers sell directly to the processor.¹⁴⁹

Saleyards

Traditionally, every town had its saleyard where livestock would be killed alongside animals sold alive. In the last 20 years many small, rural saleyards have become transit centers in amalgamations, which initially led to predictions of the saleyards' demise. However, with hundreds of millions of dollars having recently been invested in upgrading infrastructure and opening new centers, the numbers of

141. William A. Geering and Juan Lubroth, Preparation of Foot-and-Mouth Disease Contingency Plans, FAO Animal Health Manual No. 16 (Rome: Food and Agriculture Organization of the United Nations, 2002), Chapter 2: "Nature of the Disease," <https://www.fao.org/3/Y4382E/y4382e05.htm#bm05>.

142. Australian Biosecurity Centre for Emerging Infectious Diseases, Delivering for Australia (Brisbane: Biosecurity Operation, 2010), 94.

143. Between March 7, 2022 and April 28, 2022 there have been 37 human cases: "Japanese Encephalitis – Australia," World Health Organization, April 28, 2022, <https://www.who.int/emergencies/disease-outbreak-news/item/2022-DON365>.

144. Australian Biosecurity Centre for Emerging Infectious Diseases, Delivering for Australia (Brisbane: Biosecurity Operation, 2010), 149.

145. Hannah Jose, "Nipah Virus Left 100 People and a Million Pigs Dead 20 Years Ago, and It's on Australia's Doorstep," ABC News, updated November 23, 2022, <https://www.abc.net.au/news/2022-11-18/nipah-virus-pork-industry-bats-henipavirus/101546094>.

146. Rebecca K. McLean and Simon P. Graham, "The Pig as an Amplifying Host for New and Emerging Zoonotic Viruses," *One Health* 14 (2022): 100384, <https://doi.org/10.1016/j.onehlt.2022.100384>.

147. Heather Aslin et al., Peri-urban Landholders and Biosecurity Issues: A Scoping Study (Canberra: Australian Government Bureau of Rural Sciences, 2004).

148. David W. Smith et al., "Respiratory Illness in a Piggery Associated with the First Identified Outbreak of Swine Influenza in Australia: Assessing the Risk to Human Health and Zoonotic Potential," *Tropical Medicine and Infectious Disease* 4, no. 2 (2019): 96, <https://doi.org/10.3390/tropicalmed4020096>.

149. In addition, agricultural fairs (or exhibitions) have long posed a recognised biosecurity risk due to species commingling in sheds. Yet it was only in late 2022, due to the threat of FMD, that the first ban on a livestock species was introduced by a "royal" show, with the Melbourne Royal Show banning pigs altogether: Peter Somerville and Luke Radford, "Biosecurity Fears Prompt Pig Ban at the 2022 Melbourne Royal Show," ABC News, updated September 14, 2022, <https://www.abc.net.au/news/2022-09-14/pigs-banned-from-2022-melbourne-show-amid-biosecurity-fears/101438550>.

animals sold through saleyards in the last 25 years has in fact remained stable.¹⁵⁰ Pigs are sold in Warwick, Queensland, in saleyards owned by McDougall and Sons Pty Ltd, and on its website, the saleyard in Forbes (the Central West Livestock Exchange) calls itself “the last pig selling centre in New South Wales.” Since COVID-19, however, most saleyards have stopped selling pigs and instead refer producers to private selling agents. Cattle and sheep are the animals sold in large numbers in saleyard auctions.

Outside of the amalgamations, smaller rural saleyards remain in operation, generally holding weekly or biweekly sales attended by 30–40 vendors and buyers. Numbers vary seasonally, but at the height of the season there may be 50,000–60,000 sheep marketed on a sale day (for example, in Ballarat). In contrast, some saleyards may convene a sale day for only 750 sheep. The majority of saleyards are owned and operated by local councils. Others, however, are managed on council-owned land by one or another of the industry giants such as Elders or Nutrien, or operated by Elders and Nutrien jointly (as in the case of the Guyra Saleyards in New England, New South Wales and Jamestown saleyards, South Australia). Palisade Investment Partners Ltd, a private investment group, owns and operates several substantial sites across New South Wales, Queensland, and Victoria.¹⁵¹ The Muchea Livestock Centre is owned and operated by the State of Western Australia. Some saleyards are family businesses that own the land and operate the auctions, such as Prostock Livestock’s Mount Compass Saleyards in South Australia.

There are dedicated saleyards for cattle only, or sheep only, and some sell both on alternating sale days. It is not the mixing of species within saleyards that raises biosecurity concerns, but rather, the concern is the increase in susceptibility to infection, and potential infectivity, of stressed animals, arriving often after long journeys, in the absence of adequate processes in place to satisfactorily mitigate risk. Indeed, due to the increases in animal numbers and stressors (with increased distances to travel) attributable to the amalgamations, saleyards have been identified by the ABCRC as creating “obvious risks for rapid dissemination of an exotic infectious disease, particularly if the disease initially goes unnoticed.”¹⁵²

Pursuant to a National Livestock Identification Scheme (NLIS), an eight-digit code is issued to each animal by the state or territory government to identify the property of birth and supply a history of all movements. All livestock are required to be tagged under the NLIS but not all animal sales are in fact recorded; the 2022 floods revealed that many cattle were not tagged at all. Compliance has been described by one livestock exchange manager to be “terrible,”¹⁵³ despite the risks of zoonoses such as Q fever, anthrax, leptospirosis, ringworm, salmonellosis, and listeriosis.

Animal movement through the service areas needs to be followed to appreciate the biosecurity gaps.¹⁵⁴ In the first instance, animals are unloaded from trucks and left in receival pens until they are drafted into sale pens. Although regulations pertaining to saleyards vary among states, it is common for

150. James Nason, “Multi-million Dollar Investments Point to Strong Future for Saleyard Selling,” Beef Central, August 3, 2018, <https://www.beefcentral.com/markets/multi-million-dollar-investments-point-to-strong-future-for-saleyard-selling/>.

151. “Regional Livestock Exchanges,” Palisade Infrastructure, accessed September 11, 2023, <https://www.palisadegroup.com/assets/regional-livestock-exchanges/>.

152. Australian Biosecurity Centre for Emerging Infectious Diseases, *Delivering for Australia* (Brisbane: Biosecurity Operation, 2010), 159.

153. Jamie Brown, “NLIS Ear Tag Compliance Issues Affect Re-Homing of Flood Affected Cattle,” *The Land*, updated July 4, 2022, <https://www.theland.com.au/story/7716358/flood-cattle-survivors-have-no-legal-home-under-compliance-of-ear-tags-a-concern/>.

154. Australian Biosecurity Centre for Emerging Infectious Diseases, *Delivering for Australia* (Brisbane: Biosecurity Operation, 2010), 159.

regulations to define reasonable access to water as a period of continuous access over four hours so that animals are able to drink adequate quantities to rehydrate.¹⁵⁵ This is, in part, because animals can require some time to acclimatize before they are prepared to approach a trough to drink. The four hours, in theory, allow each animal to take their turn to slake their thirst. In practice, however, there are no controls in place in saleyards to ensure that sheep will spend four hours in a receival pen with a water trough. Second, overcrowding can be such that it can be simply impossible for a sheep to drink.

In fact, the animals' length of stay in the receival pen will depend on the time of day they are unloaded and whether the drafters are available to draft them. They could be drafted immediately, or they might stay in the receival pen overnight.¹⁵⁶ Sometimes sheep are moved from the incoming pen after three hours but before four and there will be no water trough in the sale pen. While cattle can generally access water in saleyards when they need it, it is not the case for sheep.¹⁵⁷ After a time in the receival pen the animals will subsequently be drafted into their sale pens, from which they are sold. Western Australia is the only state in which sale pens have water troughs.

After animals are sold, they are at some point moved to either a pen for loading into a truck or, if they are not going to be loaded until the following day, to a holding or outgoing pen with water. It is at this point when feed might be supplied. The provision of feed depends on the size of the saleyard and the communications between the buyer, the trucking company and the saleyard operator because there will be a charge for feed and this will have to be agreed upon.

Access to water is prioritized among the detailed provisions of the *Australian Animal Welfare Standards and Guidelines — Livestock at Saleyards and Depots*¹⁵⁸ (Saleyards Standards and Guidelines). The person in charge of a saleyard is required to supply reasonable access to water within 24 hours of arrival, or to spell the animal (including providing water) if the maximum time off water under the Land Transport Standards and Guidelines has been reached.¹⁵⁹ The Saleyards Standards and Guidelines emphasise that the provision of water is a key requirement for livestock welfare¹⁶⁰ and that in providing water at a saleyard, the animal's deprivation of water on the inward and outward journeys to and from the saleyard must be specifically taken into account.¹⁶¹ However, Western Australia and Queensland are the only two jurisdictions to have given the Saleyards Standards and Guidelines the force of law, and have done so only recently,¹⁶² and while deprivation of food and drink can amount to cruelty under territory and state legislation, to date there has been very little appetite for strict enforcement on saleyard

155. Animal Health Australia, *Australian Animal Welfare Standards and Guidelines — Livestock at Saleyards and Depots* (Canberra: Animal Health Australia, 2018), v 1.1, 45, "reasonable access to water." Text available at http://animalwelfarestandards.net.au/wp-content/uploads/2023/08/AAW-SG_Livestock-at-Saleyards-and-Depots_2018.pdf.

156. The time that saleyards are active on a sale day can be as short as a few hours, but in the larger venues, due to the sheer numbers of animals, they are sometimes penned overnight after the sale to be transported the following day.

157. Dawn Lowe, personal communication, August 10, 2022.

158. Animal Health Australia, *Australian Animal Welfare Standards and Guidelines — Livestock at Saleyards and Depots* (Canberra: Animal Health Australia, 2018), v 1.1, available at http://animalwelfarestandards.net.au/wp-content/uploads/2023/08/AAW-SG_Livestock-at-Saleyards-and-Depots_2018.pdf.

159. Animal Health Australia, *Australian Animal Welfare Standards and Guidelines — Livestock at Saleyards and Depots* (Canberra: Animal Health Australia, 2018), v 1.1, 29, S6.1 and S6.3, http://animalwelfarestandards.net.au/wp-content/uploads/2023/08/AAW-SG_Livestock-at-Saleyards-and-Depots_2018.pdf.

160. Animal Health Australia, *Australian Animal Welfare Standards and Guidelines — Livestock at Saleyards and Depots* (Canberra: Animal Health Australia, 2018), v 1.1, 8, http://animalwelfarestandards.net.au/wp-content/uploads/2023/08/AAW-SG_Livestock-at-Saleyards-and-Depots_2018.pdf.

161. Animal Health Australia, *Australian Animal Welfare Standards and Guidelines — Livestock at Saleyards and Depots* (Canberra: Animal Health Australia, 2018), v 1.1, 8–9, http://animalwelfarestandards.net.au/wp-content/uploads/2023/08/AAW-SG_Livestock-at-Saleyards-and-Depots_2018.pdf.

162. Animal Welfare (Transport, Saleyards and Depots) (Cattle and Sheep) Regulation 2020 (WA) (in force from October 3, 2020) and Animal Care and Protection Regulation 2021 (Qld) (from July 1, 2021). For the other states and territories, see <https://www.animalwelfarestandards.net.au/saleyards-and-depots/>.

premises. The twin problems of overcrowding and dehydration could be remedied if the detailed livestock inspection regimes set out in the Saleyards Standards and Guidelines were implemented,¹⁶³ but these are not mandatory except in Queensland and Western Australia, and there is no centralized system for incident reporting or for monitoring the accumulation of time off feed and water to ensure it does not exceed acceptable limits.

In practice there are not adequate processes in place to identify stressed or otherwise unwell animals, and close confinement of living with many other animals that they have never seen before only exacerbates the animals' stress. It is difficult for saleyard staff to observe the behaviours and conditions of individual animals when they are packed together tightly and to identify illness or disease. Overcrowding is a persistent problem in many saleyards including in regional New South Wales and in central Victoria. Stocking densities in pens have been observed to be so excessive that sheep have been unable to rise, creating dangerous conditions, including the potential for surging when pen gates are opened and the inability to access water or cool down because air circulation is inhibited.

Saleyards with a veterinarian on site constitute the extremely rare exception,¹⁶⁴ so that identifying and dealing with sick animals is left to selling agents, farmers, livestock inspectors, drivers and saleyard staff. It is not uncommon for animals to arrive with paint markings on their bodies, indicating that at the farm an issue with their health had already been identified. Nonetheless, a review of the saleyard assessments made by an NGO reveals that in the majority of cases when this NGO has been present, it has been left to up its representatives to detect animals unfit to be transported and therefore unfit for sale, and to advocate for their appropriate treatment, including immediate isolation from others in the pen. Because there are rarely veterinarians present, obtaining veterinary care for the treatment of an animal is costly, and the liability for the call-out fee usually falls to the producer selling the animal. Animals who arrive with conditions experienced during transport to the saleyards are not typically covered by transit insurance as the small farmer is unlikely to have insurance for their trailer. On the other hand, the buying agent will possess transit insurance covering illness and death on board. This creates a strong financial incentive to sell the injured or diseased animal on, with the person intervening to recommend the solution (sometimes a representative of the relevant state department, if present, sometimes saleyard management) trying to do the best by everyone, although not necessarily the animal. The failure to recognize that individual animals are compromised may also be attributable to a culture of discounted pricing for "sub-prime" animals. Until recently, one saleyard explicitly offered "crippled" animals for sale,¹⁶⁵ reflecting a culture that is far removed from that which the Saleyards Standards and Guidelines require, namely that swift action be taken, and the animal be inspected, treated, and/or humanely destroyed, to achieve animal welfare and biosecurity objectives.

Saleyards and markets should be replaced by online sales to limit any transfer of diseases and avoid the welfare problems of exposing animals in markets to the stress of the existing on-site procedures. Another area of high risk for disease due to the congregation of stressed animals and co-

163. Animal Health Australia, Australian Animal Welfare Standards and Guidelines — Livestock at Saleyards and Depots, (Canberra: Animal Health Australia, 2018), v 1.1, S1.1(i)(e) regular inspection by saleyard operator; S1.1(i)(f) 'fit for sale' inspections by selling agents; S1.1(iv)(a) 'fit for journey' inspections by consignors; S1.1(iv)(c) 'fit for journey' inspections by drivers; s4.10 inspection by person in charge at first reasonable opportunity; and see Guidelines 1.2 and 1.3 and Part 7, http://animalwelfarestandards.net.au/wp-content/uploads/2023/08/AAW-SG_Livestock-at-Saleyards-and-Depots_2018.pdf.

164. There was a veterinarian appointed to the large Muchea Livestock Centre (saleyard) in Western Australia.

165. The term is taken from a sign that was displayed at a saleyard in South Australia.

regulation with the livestock industry arises within the so-called live export trade.

LIVE SHEEP AND CATTLE EXPORTS

Over the last 30 years Australia has operated a major export industry in livestock, sent by ship to mostly Asia and the Middle East.¹⁶⁶ After significant growth at the end of the 20th century, sheep exports have declined steadily from four million in 2003 to less than one million today, the reduction being mainly a result of a prolonged drought, the low profitability of the Australian sheep industry, and concerns about the continuity of supply in the face of government restrictions on exports. However, Australia still exports sheep to a variety of countries around the world, including Kuwait, the United Arab Emirates, Jordan, Oman, Bahrain, Qatar, Egypt, Israel, Lebanon, territories administered by Palestine, Ukraine, Malaysia, Singapore, Mauritius, New Zealand, Vanuatu, Brunei, China, Japan, USA, Mexico, Argentina, Chile, and the Philippines.

The countries in the Gulf Cooperation Council (GCC), that is, the Arab states of the Persian Gulf, are the most common destination for sheep, particularly Kuwait, Qatar, and the UAE, as well as Jordan. Imports usually increase in advance of the Festival of Eid al-Adha, when large numbers of sheep are sacrificed as an act of devotion in remembrance of God saving the son of Ibrahim (Christian: Abraham) and replacing him with a lamb. The meat is shared with family, neighbors, and poor people. Sheep destined for GCC countries may be offloaded at several ports in the Gulf. The risk of heat stress during offloading in the Middle Eastern summer is high,¹⁶⁷ particularly since the Festival, which advances by approximately 11 days each year, now occurs soon after midsummer in the Middle East. The Australian Government has restricted sheep shipments during the Australian winter because of this.

The cattle trade is economically more significant, with 600,000 to one million cattle exported annually. The markets have been growing recently, but also changing from one dominated by exports to Indonesia to a more diversified market with growth in Vietnam and China, and to a lesser extent in Malaysia. Cattle are also exported to the Middle East, North Africa, and countries surrounding the Black Sea. The major causes of cattle mortality, which is considerably lower than for sheep, are heat stress, trauma and respiratory diseases.¹⁶⁸

Approximately three quarters of sheep for the Middle East trade are sourced from the southern parts of Western Australia, the remainder from Victoria and South Australia. Most cattle are sourced from the north of Australia, especially the Northern Territory and Western Australia. Both cattle and sheep spend several hours in handling yards after mustering, often being held overnight, so that they can cool down and reduce their stress before departing by truck for a pre-embarkation assembly depot. Transport is usually by two-tiered, naturally ventilated trucks with one to three trailers. Capacity of the trucks is typically 50-100 cattle or 700-900 sheep, depending on the animals' live weight, and in the case of sheep, wool length.¹⁶⁹

166. It is this that has led to the demise of abattoirs, at least in the north of Australia, for the processing of these animals at home.

167. Francesca Carnovale and Clive J. C. Phillips, "The Effects of Heat Stress on Sheep Welfare During Live Export Voyages from Australia to the Middle East," *Animals (Basel)* 10, no. 4 (2020): 694, doi: 10.3390/ani10040694.

168. Moore et al., "Mortality of Live Export Cattle on Long-haul Voyages: Pathologic Changes and Pathogens," *Journal of Veterinary Diagnostic Investigation* 26, no. 2 (2014): 252–265.

169. NSW Government Transport Roads & Maritime Services, *Livestock Loading Calculator User Guide*, last updated April 10, 2012, <https://roads-waterways.transport.nsw.gov.au/documents/business-industry/heavy-vehicles/livestock-calculator-user-guide.pdf>.

Sheep and cattle for live export are sourced from farms all over Australia, but most sheep come from Western Australia and cattle from northern Australia, since this is where the animals depart for destinations in the Middle East and South-east/East Asia, respectively. They are kept at a pre-assembly depot for three to 10 days to adjust to, first, confinement with unfamiliar animals, and, second, the change in diet from pasture to pellets. On the day before or the day of departure they are taken by trucks from the depot to the port, where they are mixed with other livestock offloading from trucks. During this offloading process they are inspected by an Australian Quarantine and Inspection Service (AQIS) officer for signs of ill-health, in particular lameness, which would make them unfit to load. If they pass this inspection, they enter the ship, where they are directed into their pen via a series of ramps. Following disembarkation, livestock (particularly cattle) are either delivered directly to a feedlot or they are loaded onto transport to take them to an abattoir. The transport systems are often not as well developed as those used in Australia to take them to the ship, with some animals being loaded onto/into cars and others into small trucks. Following a period in the feedlot for further growth, animals are usually delivered, either alive or as carcasses, to wholesalers who send the meat to retailers operating in the wet markets.

In the case of Australia's live sheep exports, Saudi Arabia was traditionally Australia's biggest market, but since 2012 it has refused Australian live sheep exports because the (live) Export Supply Chain Assurance Scheme insisted upon by Australia challenges Saudi's sovereignty over imports. Other countries also have concerns that World Animal Health Organisation (OIE) guidelines should be applied with varying degrees of conformity.¹⁷⁰ The competition for Australia's live sheep exports comes from live sheep from the Horn of Africa and lamb meat products exported by New Zealand, Pakistan, Sudan, and other African countries. Saudi Arabia has a young, rapidly growing population that may be receptive to changing meat purchasing habits towards supermarket purchases. Road transport networks within the country are well developed, rail freight is developing, and there is generally good infrastructure. Competition for cattle exports comes from Brazil, which now exports to Indonesia, and India, which exports buffalo meat at a slightly lower price than Brazilian beef.

There are a number of diseases that pose risks to exported livestock, who, when infected, may transmit the disease to the local livestock population and also, in the case of zoonotic diseases, to the human population. The risk of disease is likely to be increased by the unhealthy and stressful conditions on Australian live export ships, as well as the stress endured over several weeks, and in some cases months, as the animals make the long journey from grazing lands in Australia to the slaughterhouse in an importing country. The incidence of orf in Australian live export sheep shipments is not precisely known, but it was recorded at 6% in the Cormo Express, a shipment rejected by Saudi authorities in 2003 because it was above the 5% maximum prevalence. The concentration of sheep into the pre-embarkation depot and on the ship provides ideal conditions for transmission of the disease. Vaccination is possible before export, but it is not completely effective in controlling it.¹⁷¹ It is highly contagious to humans, infecting about a quarter of those living or working with sheep.¹⁷²

170. Department of Agriculture, Water and the Environment, "The Independent Review of Australia's Live Export Trade (Farmer's Review)," 2011.

171. Higgs et al., "Contagious Ecthyma in the Live Sheep Export Industry," *Australian Veterinary Journal* 74, no. 3 (1996): 215–20, <https://doi.org/10.1111/j.1751-0813.1996.tb15407.x>.

172. G. A. Paiba et al., "Orf (Contagious Pustular Dermatitis) in Farmworkers: Prevalence and Risk Factors in Three Areas of England," *VetRecord* 145, no. 1 (1999): 7–11, <https://doi.org/10.1136/vr.145.1.7>; "Contagious Pustular Dermatitis (Orf)," National Animal Disease Information Service, accessed September 13, 2023, <https://nadis.org.uk/disease-a-z/sheep/contagious-pustular-dermatitis-orf/#:~:text=Contagious%20pustular%20dermatitis%20is%20a%20zoonosis%20%28can%20affect,in%20proliferative%20lesions%20following%20trauma%20of%20the%20lips%2Fgums.>

Another major cause of disease in sheep travelling from Australia to the Middle East is salmonellosis, which can be transmitted to humans handling the animals, either on board or on arrival. It is a gastrointestinal infection, exacerbated by the stress of transport,¹⁷³ particularly if sheep become inappetent during the journey from Australia to the Middle East.¹⁷⁴ It is a zoonotic disease most commonly transmitted to people who do not wash their hands after handling animals or contact with their environment, their food, water, or living quarters. Transmission risk is likely to be increased because of the hand-to-mouth and communal plate eating conventions in the Middle East and other livestock recipient countries in Asia. The hot temperatures in summer aid survival of the bacteria: optimal temperature for the salmonella organism is 35°-43°C, and it survives up to 54°C.¹⁷⁵ *S. typhimurium*, the most common serotype affecting sheep on Australia's live export ships, infects both livestock and humans, and it is of concern that there are multidrug resistance serotypes, such as DT104. In Australia there are about 50 reported cases of salmonellosis per 100,000 human population each year, with *S. typhimurium* being the most common serovar. Salmonella has been isolated from about 3% of slaughtered cattle in Australia.

It is highly likely that live shipments of sheep and cattle are bringing salmonellosis into the Middle East. An early study of sheep and goats imported from Australia and other countries and then slaughtered in Saudi Arabia found 14% of sheep and 19% of goats to be infected with salmonella.¹⁷⁶ A more recent survey conducted in the Greater Amman Abattoir in Jordan, the country's biggest,¹⁷⁷ found that of 518 imported cattle slaughtered at this abattoir, arriving from South America and Romania, 71% were contaminated with *S. enterica*. While they could have been contaminated while awaiting slaughter in Jordan, it is most likely that the cattle were contaminated before arrival. Of even greater concern is that 70% of the infected animals exhibited multidrug resistance and 93% resisted at least one antimicrobial, including resistance to the drugs most commonly used to treat salmonellosis in humans. Pneumonia in cattle and sheep is another disease commonly seen in exported livestock.¹⁷⁸ Vaccination is possible, but the wide variety of organisms that may infect livestock may render this unsuccessful in protecting the animals. Susceptibility to the disease is increased by stress.¹⁷⁹ The mycoplasmal form, *M. ovipneumoniae*, multiplies rapidly in times of stress and inclement weather. At least one bacterial form (*Coxiella burnetii*, causing Q fever pneumonia) is considered "extremely hazardous" to the welfare of cattle, is endemic in the northern states of Australia, and may be transmitted to humans.¹⁸⁰ Also of

173. A. Fraser and J. T. Stamp, *Sheep Husbandry and Diseases*, (London: Crosby, Lockwood and Son, 1957), 369.

174. Higgs, R. T. Norris, and R. B. Richards, "Epidemiology of Salmonellosis in the Live Sheep Export Industry," *Australian Veterinary Journal* 70, no. 9 (1993): 330–335.

175. C. C. Adley and M. P. Ryan, "The Nature and Extent of Foodborne Disease," in *Antimicrobial Food Packaging*, ed. J. Barros-Velázquez (San Diego: Academic Press, 2016).

176. Nassim H. Nabbut and Habeeb M. Alnakhli, "Incidence of Salmonellae in Lymph Nodes, Spleens and Feces of Sheep and Goats Slaughtered in the Riyadh Public Abattoir," *Journal of Food Protection* 45, no. 14, (1982): 1314–7, <https://doi.org/10.4315/0362-028X-45.14.1314>.

177. Mohammad M. Obaidat, "Prevalence and Antimicrobial Resistance of *Listeria monocytogenes*, *Salmonella enterica* and *Escherichia coli* O157:H7 in Imported Beef Cattle in Jordan," *Comparative Immunology, Microbiology and Infectious Diseases*, 70 (2020): 101447, <https://doi.org/10.1016/j.cimid.2020.101447>.

178. Nigel Perkins and Tristan Jubb, *Live Export Veterinary Disease Handbook: Final Report* (Sydney: Meat & Livestock Australia Limited, 2012), https://www.mla.com.au/contentassets/2fcf7017f4d24e33bd57c9950fe738bf/w.liv.0278_final_report.pdf.

179. Johnston, 1983, p 183

180. E. G. W. Huisjens et al., "Evaluation of Patients with Community-Acquired Pneumonia Caused by Zoonotic Pathogens in an Area with a High Density of Animal Farms," *Zoonoses and Public Health* 63, no. 2 (2016): 160–6, <https://doi.org/10.1111/zph.12218>.

concern are coronaviruses, which have a high mutation rate and readily jump the species barrier.¹⁸¹ Bovine coronaviruses infect the respiratory and intestinal tract and have been occasionally found in humans. In a sample of live export shipments, 13% of cattle had coronaviruses.¹⁸² Coronaviruses contain a hemagglutinin esterase protein that allows them to bond to multiple cell types. There is an extensive reservoir in wild ruminants, such as water buffalo and camels, which are under pressure from humans due to deforestation and climate change, forcing the virus to mutate in response to novel and stressful environments. Camels, which are ruminant livestock like cattle and sheep, appear to have been the intermediate host reservoir species for Middle East respiratory syndrome coronavirus (MERS),¹⁸³ since antibodies to the MERS virus have been found in a high proportion of Saudi Arabian camels. This virus posed a particular risk to those working with and killing camels¹⁸⁴ and claimed the lives of almost a thousand people in the second decade of this millennium.¹⁸⁵ The risk of another coronavirus establishing itself in the human population from imported livestock is significant, especially since cattle commonly have coronavirus infections.¹⁸⁶ Humans travelling with the livestock ships have been found to transmit coronaviruses during the COVID-19 outbreak.¹⁸⁷

Animal exporters have to comply with both importing country regulations and the regulations and administrative requirements set by DAFF. DAFF issues licences for animal exports to exporters, which are compulsory. These can be, and have been, revoked if exporters are found to breach standards set for live export of animals. The *Australian Meat and Live-stock Industry Act 1997* and the *Export Control (Animals) Order 2004* describe the permit system for exporters, through provision of export licences. Superimposed upon this system is the Export Supply Chain Assurance Scheme (ESCAS), which requires exporters to demonstrate compliance with OIE guidelines for the export of livestock, control the movement and traceability of their animals within the supply chain, and organize independent auditing of compliance with these requirements. If this is assured, approval is given by the DAFF. However, it is questionable whether the Australian Government has the ability to monitor compliance in countries outside of their jurisdiction. There have been regular animal welfare incidents since the establishment of regulatory control by the Federal Government.

The main instrument used by the Australian Government to monitor animal welfare on ships is the captain's records of mortality, which are reported to the federal government at the end of each voyage and in summary to the federal Parliament every six months. If mortality on an individual voyage is high, there is a government investigation and public reporting of the findings. Recently, the government has attempted, with the aid of an independent scientific panel, to impose restrictions on sheep exports to

181. Haithem Mohamed Amer, "Bovine-like Coronaviruses in Domestic and Wild Ruminants," *Animal Health Research Reviews* 19, no. 2 (2018): 113–24, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7108644/>.

182. Moore et al., "Mortality of Live Export Cattle on Long-haul Voyages: Pathologic Changes and Pathogens," *Journal of Veterinary Diagnostic Investigation* 26, no. 2 (2014): 252–265.

183. Sherif A. El-Kafrawy et al., "Enzootic Patterns of Middle East Respiratory Syndrome Coronavirus in Imported African and Local Arabian Dromedary Camels: A Prospective Genomic Study," *The Lancet Planetary Health* 3, no. 12 (2019): e521–8, [https://doi.org/10.1016/S2542-5196\(19\)30243-8](https://doi.org/10.1016/S2542-5196(19)30243-8).

184. Sherif A. El-Kafrawy et al., "Enzootic Patterns of Middle East Respiratory Syndrome Coronavirus in Imported African and Local Arabian Dromedary Camels: A Prospective Genomic Study," *The Lancet Planetary Health* 3, no. 12 (2019): e521–8, [https://doi.org/10.1016/S2542-5196\(19\)30243-8](https://doi.org/10.1016/S2542-5196(19)30243-8).

185. Neeltje van Doremalen et al., "Stability of Middle East Respiratory Syndrome Coronavirus in Milk," *Emerging Infectious Diseases* 20, no. 7 (2014): 1263–4, https://wwwnc.cdc.gov/eid/article/20/7/14-0500_article.

186. Lorenz Ulrich et al., "Experimental Infection of Cattle with SARS-CoV-2," *Emerging Infectious Diseases* 26, no. 12 (2020): 2979–81, https://wwwnc.cdc.gov/eid/article/26/12/20-3799_article.

187. Eliza Laschon, "Coronavirus Outbreak on Al Messilah Livestock Carrier at Fremantle Port Sees 24 More Crew Members Test Positive," ABC News, October 19, 2020, <https://www.abc.net.au/news/2020-10-19/another-24-cases-of-coronavirus-on-al-messilah-at-fremantle-port/12782686>.

the Middle East if heat stress is likely to reduce the welfare, rather than mortality, of sheep.

Restrictions may also be imposed by importing countries, for example, maximum disease prevalence, or in the case of cattle, a maximum 350 kilograms import weight imposed in 2010 by Indonesia, Australia's biggest Asian market.¹⁸⁸ Religious restrictions on slaughter of livestock to meet Islam's halal standards are less stringent for animals slaughtered in Australia and then sent to Indonesia than for those that are destined for the Middle East. This particularly supports a live sheep export trade to the Middle East, which is also aided by fodder and water subsidies provided by a number of GCC governments.¹⁸⁹

The Australian government has supported the preparation of Australian Standards for the Export of Livestock,¹⁹⁰ ostensibly the strictest in the world. However, revisions to take account of emerging knowledge have until recently been infrequent and piecemeal, for example, a reduction in stocking densities in 2019, rather than across the entire set of standards.

In addition to regulatory standards, the Australian government has from time to time invoked Memoranda of Understanding with specific countries, most notably Egypt.¹⁹¹ These invoke specific requirements on exporters, for example, to have arrangements with the relevant authorities in the importing country for improved standards of husbandry of Australian livestock, especially during slaughter. This is a means of maintaining the live export industry through imposition of higher standards, when regulatory standards have failed to stop serious welfare consequences during or after the export. The government also required, from April 2018 to October, 2019, the presence of independent observers on live export ships, because of concerns that veterinarians and stock people on board were employed by the industry and therefore might cover up welfare issues. However, this requirement was abandoned in 2019.

The history of live export of sheep from Australia has been one of repeated revelations of cruelty, followed by independent investigations recommending significant changes to the industry. Government response has usually fallen short of supporting sufficient change to the industry to curtail the cruelty which the animals are exposed to. A recent review of the sheep exports from Western Australia considers this to be "wholesale regulatory failure".¹⁹² For example, following an exposé of serious heat stress in sheep exported to the Middle East, the Australian government's Heat Stress Risk Assessment committee, comprising mainly independent scientists, recommended major revision to the export of sheep into this region in the northern hemisphere summer. However, the government response indicates that this would have too great an economic impact on the sheep industry and would also impact on the reputation of the sheep exporters if the changes resulted in them being unable to fulfill orders at certain

188. The impact of a weight restriction is that animals entering the country mostly initially enter a feedlot to gain further weight before slaughter, enabling the importing country to claim to be self-sufficient in slaughter livestock. There have been regular concerns about Indonesian internal livestock transport standards (C. J. C. Phillips, *The Animal Trade*, [Oxford: CAB International, 2015], 105) and slaughter standards in the many small-scale abattoirs operating legally and illegally: Latika Bourke, "'Barbaric' Footage Shows Australian Cattle Slaughtered Illegally in Indonesia," *The Sydney Morning Herald*, August 18, 2020, <https://www.smh.com.au/politics/federal/barbaric-footage-shows-australian-cattle-slaughtered-illegally-in-indonesia-20200818-p55mnt.html>.

189. Coombs and Gobett, undated

190. "Australian Standards for the Export of Livestock," Department of Agriculture, Fisheries and Forestry, accessed September 13, 2023, <https://www.agriculture.gov.au/biosecurity-trade/export/controlled-goods/live-animals/livestock/australian-standards-livestock>.

191. Leah Ferris, "The Effectiveness of the Exporter Supply Chain Assurance System," *Flagpost*, May 24, 2013, <http://parliamentflagpost.blogspot.com/2013/05/the-effectiveness-of-exporter-supply.html#more>.

192. Alistair Davey and Roger Fisher, *Live Sheep Export Trade: Review of the Draft Regulation Impact Statement*, (Canberra: Pegasus Economics, 2020), <https://www.agriculture.gov.au/sites/default/files/documents/draft-ris-animals-australia-attachment-pegasus-report.pdf>.

times of year. An independent report by Pegasus Economic suggested that the impact would at most be “modest.”¹⁹³

In this way, the Australian Government has traditionally united with industry to support investments in infrastructure that will develop or maintain the live export industry, for example the Live Animal Trade Program and its successor, the Live Trade Animal Welfare Partnership.

In March 2020, a Regulation Impact Statement was put in place by Australia’s (then) Department of Agriculture, Water and the Environment that prohibits the export of sheep during the northern hemisphere’s hot weather between June 1 and September 14.¹⁹⁴ In an attempt to manage the risk of heat stress, all voyages must have automated loggers and report to the Department the temperature and humidity data recorded. However, the number of monitoring points is insufficient to gain an accurate knowledge of temperature and humidity.¹⁹⁵ These changes were made on the recommendation of the industry itself and its representative bodies, principally Meat and Livestock Australia and the Australian Livestock Export Corporation (LiveCorp). Hence, although the standards are prescribed by the government, this is an example of how they are drafted by industry to make it appear that something is being done to address public concerns.¹⁹⁶ Many farmers, pastoralist and grazier organizations, such as the ones in Western Australia, want to see live export operating all year around and are rebutting any government regulations. However, the industry bodies are putting some restrictions in place under pressure from animal advocacy groups, such as Australia’s Royal Society for the Prevention of Cruelty to Animals and Animals Australia, and the broader community, in order to protect its social license to operate.

Although live exports do not operate outside the law in Australia, there are regular reports about non-compliance and cruelty against livestock on carriers and in countries importing Australian animals.¹⁹⁷ The response by the Australian Government is usually to conduct an independent inquiry and, depending on its findings, cancel the license of the exporters or temporarily suspend the trade with the relevant parties. A whistleblower hotline for live sheep exports was introduced in 2018. In 2020, the livestock industry requested an exemption from the summer heat travel restrictions for 56,000 sheep that were scheduled to depart before June 1, 2020 but were delayed because ship crew members infected with Covid-19 were quarantined for two weeks. This permission was granted¹⁹⁸ but the incident caused undue confusion in all involved, and it demonstrated that there was a strong pressure from the community against such an exemption.¹⁹⁹

193. Alistair Davey and Roger Fisher, *Live Sheep Export Trade: Review of the Draft Regulation Impact Statement*, (Canberra: Pegasus Economics, 2020), 57, <https://www.agriculture.gov.au/sites/default/files/documents/draft-ris-animals-australia-attachment-pegasus-report.pdf>.

194. Aidan Smith, “More Restrictions on Live Export Trade,” *Farm Weekly*, April 4, 2020, <https://www.farmweekly.com.au/story/6711209/more-restrictions-on-live-export-trade/>.

195. Yu Zhang, Allan T. Lisle, and Clive J. C. Phillips, “Development of an Effective Sampling Strategy for Ammonia, Temperature and Relative Humidity Measurement During Sheep Transport by Ship,” *Biosystems Engineering* 155 (2017): 12–23, <https://doi.org/10.1016/j.biosystemseng.2016.11.010>.

196. Jordan M. Sosnowski, *Detailed Discussion of Australian Live Export Laws* (East Lansing: Michigan State University School of Law, 2013), <https://www.animallaw.info/article/detailed-discussion-australian-live-export-laws>.

197. Claire Petrie and Rob Dossor, “Regulating Live Exports,” *Parliament of Australia*, accessed September 13, 2023, https://www.aph.gov.au/About_Parliament/Parliamentary_Departments/Parliamentary_Library/pubs/BriefingBook45p/LiveExports; Claire Petrie, “Live Export: A Chronology,” *Parliament of Australia*, updated September 6, 2019, https://www.aph.gov.au/About_Parliament/Parliamentary_Departments/Parliamentary_Library/pubs/rp/rp1920/Chronologies/LiveExport.

198. Aidan Smith, “Live Export Backflip: RETWA Gets Exemption to Export Stranded Sheep,” *Farm Weekly*, June 16, 2020, <https://www.farmweekly.com.au/story/6795740/live-export-backflip-retwa-gets-exemption-to-export-stranded-sheep/>.

199. Terry Sim, “WA Farmers and RSPCA Face Off Over Live Sheep Export Exemption,” *Sheep Central*, May 28, 2020, <https://www.sheepcentral.com/wa-farmers-and-rspca-face-off-over-live-sheep-export-exemption/>.

As of November 1, 2020, the Australian Government's new Standards for the Export of Livestock²⁰⁰ allowed exporters to have reduced pen allowances for cattle and sheep if they could demonstrate low mortality rates on previous voyages. This was despite recently published evidence that these space allowances caused behavioral and physiological stress, at least to sheep.²⁰¹ This reduction in the allocated space per animal was in response to lobbying by livestock exporters.²⁰² A low space allowance for livestock will increase stress,²⁰³ which is likely to increase the probability that they will harbor and develop diseases because of compromised immune systems.²⁰⁴

Since 2012, there have been numerous calls for an independent body to be established, namely an Office of Animal Welfare,²⁰⁵ comprising representatives from industry, animal welfare organisations and independent scientists. Such a body would be better placed to advise the Australian Government and would be in a position to balance economic considerations with ethical concerns. However, such a body has yet to be accepted as needed and the government continues to operate in a political union with the livestock industry, giving little attention to the concerns from broader society. Instead of independent advice, the processes of co-regulation and lobbying persist.

BARRIERS TO EFFECTIVE REGULATION

Avian influenza virus and the Hendra virus are two examples where wildlife have transmitted disease to humans through livestock. Biosecurity in livestock is critical to prevent the spread of zoonotic disease, and preventative measures include surveillance by qualified animal health workers and early detection. But while these measures are critical, they are also resource-intensive²⁰⁶ and can be perceived as a burden by producers resisting the imposition of onerous regulations. For those who export live animals, the problem sails off-shore with the ships. For Australian farmers, in truth, there is a strong underlying interest in preventative biosecurity, as it is less costly in the long run than managing an outbreak of disease on Australian soil. Unfortunately, short-term economic interests sometimes take precedence, creating serious biosecurity risks.²⁰⁷

The primary advocates outside of the industry for the isolation and treatment (or humane destruction) of farmed animals that pose biosecurity threats have been animal welfare advocates, at

200. "Australian Standards for the Export of Livestock," Department of Agriculture, Fisheries and Forestry, accessed September 13, 2023, <https://www.agriculture.gov.au/biosecurity-trade/export/controlled-goods/live-animals/livestock/australian-standards-livestock>.

201. Grisel Navarro, Ramazan Col, and Clive J. C. Phillips, "Effects of Doubling the Standard Space Allowance on Behavioural and Physiological Responses of Sheep Experiencing Regular and Irregular Floor Motion During Simulated Sea Transport," *Animals (Basel)* 10, no. 3 (2020): 476, <https://doi.org/10.3390/ani10030476>.

202. Beef Central, "Livestock Exporters Welcome Last Minute Ship Stocking Rate Change," Beef Central, October 28, 2020, <https://www.beefcentral.com/live-export/livestock-exporters-welcome-last-minute-ship-stocking-rate-change/>.

203. Grisel Navarro, Ramazan Col, and Clive J. C. Phillips et al., "Effects of Doubling the Standard Space Allowance on Behavioural and Physiological Responses of Sheep Experiencing Regular and Irregular Floor Motion During Simulated Sea Transport," *Animals (Basel)* 10, no. 3 (2020): 476, <https://doi.org/10.3390/ani10030476>.

204. Clive Phillips, "Coronavirus: Live Animals are Stressed in Wet Markets, and Stressed Animals are More Likely to Carry Diseases," *The Conversation*, April 15, 2020, https://theconversation.com/coronavirus-live-animals-are-stressed-in-wet-markets-and-stressed-animals-are-more-likely-to-carry-diseases-135479#comment_2197463.

205. J. Goodfellow, "Animal Welfare Regulation in the Australian Agricultural Sector: A Legitimacy Maximising Analysis," PhD thesis, Macquarie University, 2015.

206. Daniel S. Layton, Anupma Choudhary, and Andrew G. D. Bean, "Breaking the Chain of Zoonoses Through Biosecurity in Livestock," *Vaccine* 35, no. 44 (2017): 5967–73.

207. According to the Australian Productivity Commission, "governments' and businesses' interests are not always aligned — for example, a farmer transporting cattle may not disclose the symptoms of a particular animal to avoid the entire load from being quarantined or destroyed." Australian Government Productivity Commission, *Regulation of Australian Agriculture: Productivity Commission Inquiry Report 79* (November 15, 2016): 328.

least before COVID-19 brought threats of zoonotic pandemic to the forefront of many peoples' minds. Their driving concern centers on the experience of the animal and their cohort, and a desire to alleviate the animals' suffering. In this way, animal welfare advocates have contributed to biosecurity by proxy. However, the tools at their disposal have been animal welfare laws and guidelines whose content often represents industry practice, and which are administered by state and territory government departments, who are also responsible for promoting the profitability of the agricultural industries and are not widely perceived to be impartial regulators.²⁰⁸

In an important study undertaken in 2013, Goodfellow analyzed the “actions of government in addressing the regulatory problem of the impact of industrial farming methods on the welfare of animals” with a view to assessing the legitimacy of that regulatory response.²⁰⁹ The context in which the question arose included trends that have only intensified since the study was conducted, such as the concentration of ownership and scale of livestock farming that has created the “sheer number of animals” that prevents “any possibility of providing individual care.”²¹⁰ Access to water and feed, and serious welfare hazards associated with long distance transport by ship and truck, were among the high-risk issues identified in the study, against which the responses of relevant departments of agriculture were evaluated.

In undertaking the study, Goodfellow analyzed surveys and other literature that studied contemporary community expectations with respect to animal welfare on farms. He analyzed foundational case law to benchmark how appropriate balancing of welfare and economic considerations could take place (especially the concept of acceptable harm that is proportionate to need²¹¹). He scrutinised the relevant animal welfare statutes and regulations and farming codes and guidelines and analyzed the history of the (still-dominant) codes of practice.²¹² Goodfellow's study noted that an independent review of the codes of practice undertaken in 2005 by Geoff Neumann found that they were unsatisfactory, confusing documents and that clear and definitive standards were needed,²¹³ and noted that animal welfare advocates viewed the codes as documents that legitimize practices that harm animals. It is one of the regulatory objectives that Goodfellow identifies as a reasonable action to be expected from a well-functioning regulator, that the codes would be updated or superseded by industry-wide, enforceable standards as recommended by Neumann, and it is telling that several years after Goodfellow's study, significant progress has not yet been made to complete this task. Goodfellow also noted that animal welfare attracts “a fraction of one percent of most department of agriculture funding arrangements.”²¹⁴

At the heart of Goodfellow's study was a series of interviews he undertook with senior personnel

208. Arnja Dale and Steven White, “Codifying Animal Welfare Standards: Foundations for Better Animal Protection or Merely a Façade?” in Peter Sankoff, Steven White, and Celeste Black (eds.), *Animal Law in Australasia*, 2nd ed. (Alexandria: Federation Press, 2013), 166–8, cited in J. Goodfellow, “Animal Welfare Regulation in the Australian Agricultural Sector: A Legitimacy Maximising Analysis,” PhD thesis, Macquarie University, 2015, 6.

209. J. Goodfellow, “Animal Welfare Regulation in the Australian Agricultural Sector: A Legitimacy Maximising Analysis,” PhD thesis, Macquarie University, 2015, 7, 23.

210. J. Goodfellow, “Animal Welfare Regulation in the Australian Agricultural Sector: A Legitimacy Maximising Analysis,” PhD thesis, Macquarie University, 2015, 36.

211. *Ford v Wiley* 23 QBD 203 (UK, 1889).

212. As previously noted, these effectively codified industry practice at a given time and, via incorporation by statute and regulation, now provide exemptions from cruelty laws wherever conformity with the codes can be shown.

213. J. Goodfellow, “Animal Welfare Regulation in the Australian Agricultural Sector: A Legitimacy Maximising Analysis,” PhD thesis, Macquarie University, 2015, 126–7.

214. J. Goodfellow, “Animal Welfare Regulation in the Australian Agricultural Sector: A Legitimacy Maximising Analysis,” PhD thesis, Macquarie University, 2015, 193.

in government departments across the nation. These interviews took place against an analysis of the design and structure of government departments, which showed responsibility for animal welfare in departments to be in tension with the primary goals of these government departments, which were “to promote the productivity and profitability of primary industries.” The themes that emerged from the interviews were that:

1. The design of the regulatory framework produces structural incentives prioritising productivity goals over animal welfare;
2. Regulators identify more strongly with livestock industry stakeholders than with animal welfare stakeholders;
3. Regulators take a primarily instrumental view of animal welfare;²¹⁵
4. Regulators take a cooperative/ partnership approach to animal welfare regulation with the agricultural sector.²¹⁶

It is not suggested here, or by Goodfellow, that regulation by cooperation is inherently problematic. Goodfellow relies on Neil Gunningham’s work on meta- (or self-) regulation to posit that the starting point for an approach that assumes virtue (compliance) on the part of the regulated, is that robust systems must be in place in case of noncompliance, and dialogue, followed by strong measures, must be engaged immediately upon noncompliance occurring.²¹⁷ Goodfellow is doubtful that these features—prerequisites for a cooperative approach to enforcement—are in fact present in the context of agricultural use of animals.²¹⁸ Indeed, from the departments’ and Ministers’ close, “cliente-like” relationship with the livestock industry, understood in the context of institutional settings that incentivise deprioritizing animal welfare, he concludes that a strong case of regulatory capture emerges,²¹⁹ bearing a close family resemblance, unfortunately, with the political union between regulators and livestock exporters described above.

COVID-19 PANDEMIC AND THREATS OF ZOOONOTIC INCURSION

As in other parts of the world, a major contributor to COVID-19 hotspots of local transmission

215. An instrumental view means the view that an animal is to be used for human benefit. Goodfellow notes that in contrast, the community’s views appear to be “moving more towards an ethic of care and compassion”: J. Goodfellow, “Animal Welfare Regulation in the Australian Agricultural Sector: A Legitimacy Maximising Analysis,” PhD thesis, Macquarie University, 2015, 71, 89.

216. J. Goodfellow, “Animal Welfare Regulation in the Australian Agricultural Sector: A Legitimacy Maximising Analysis,” PhD thesis, Macquarie University, 2015, 182.

217. J. Goodfellow, “Animal Welfare Regulation in the Australian Agricultural Sector: A Legitimacy Maximising Analysis,” PhD thesis, Macquarie University, 2015, 261, citing Neil Gunningham, “Enforcing Environmental Regulation,” *Journal of Environmental Law* 23, no. 2, (2011): 191.

218. J. Goodfellow, “Animal Welfare Regulation in the Australian Agricultural Sector: A Legitimacy Maximising Analysis,” PhD thesis, Macquarie University, 2015, 261.

219. J. Goodfellow, “Animal Welfare Regulation in the Australian Agricultural Sector: A Legitimacy Maximising Analysis,” PhD thesis, Macquarie University, 2015, 271.

were meat-processing facilities. For example, Cedar Meats in Victoria had 110 cases linked to it and was one of the spots linked to Australia's second wave of the virus.²²⁰ Somerville Meats and JBS Meats, also in Victoria, similarly had high numbers of locally acquired cases. Factors that propelled the spread of the virus included people working in close proximity to each other, poor air quality, cold temperatures, humidity, and smooth plastic and metal-working surfaces. Noise within meatworks forces people in close proximity to speak loudly to be heard, potentially releasing high levels of droplets and aerosols into the air, which is also said to be responsible for greater transmission numbers than those in the community.²²¹

Some of the regulations introduced by governments to protect against the spread of COVID-19 benefited workers in the meat-processing facilities including in slaughterhouses in Australia. These include physical distancing, safety protocols, use of protective equipment, and access to paid pandemic leave. However, the processing capacity of many meat and poultry facilities decreased, causing the disruption of supply chains and increases in price. The nature of the problem is deeper than the risk posed to individual workers or consumers. A study by Taylor et al.²²² shows that meat processing represents a significant public health risk in relation to COVID-19, particularly in the case of large-scale meat production, processing, and packaging.

The Australian government also officially recognizes the high risk associated with the meat-processing industry, with people who work there being given a priority in receiving a COVID-19 vaccine (together with defense, police, fire, and emergency services). Hence, the current emphasis of government policies is on improving people's safety without emphasizing the need for dietary changes.

There are, however, some positive trends happening without government support. An analysis of vegan Google searches around the world revealed an increase in popularity of plant-based food options during the COVID-19 pandemic.²²³ At the time of writing, Australia holds second place in the world (following the United Kingdom) for the popularity of veganism, according to this Google trends report. This increased interest in plant-based options seems to be spreading across the entire globe, with COVID-19 acting as at least a contributing catalyst.²²⁴

Likewise at the time of writing, there is panic within industry that FMD might enter Australia and spread to livestock after it was detected in May 2022 in East Java and spread to Bali, a popular destination for Australian tourists. Concerns include a potential transmission cycle between Australian livestock and wild populations that would be difficult to break. The wild species of concern include water buffalo and pigs, the latter of which are common in the north of Western Australia and cover over 40% of the continent.²²⁵ A Commonwealth Government taskforce was formed by the newly elected Labour Federal Government in August 2022 to "stress-test" existing biosecurity plans in light of the FMD threat, and a Senate Standing Committee has commenced an inquiry into the adequacy of the

220. Shelley Marshall and Carla ChanUnger, "Treating Workers Like Meat: What We've Learnt from COVID-19 Outbreaks in Abattoirs," *The Conversation*, October 13, 2020, <https://theconversation.com/treating-workers-like-meat-what-weve-learnt-from-covid-19-outbreaks-in-abattoirs-145444>.

221. Anna Stewart, Ivana Kottasová, and Aleesha Khaliq, "Why Meat Processing Plants Have Become COVID-19 Hotbeds," *CNN Health*, updated June 17, 2020, <https://edition.cnn.com/2020/06/27/health/meat-processing-plants-coronavirus-intl/index.html>.

222. Charles A. Taylor, Christopher Boulos, and Douglas Almond, "Livestock Plants and COVID-19 Transmission," *Proceedings of the National Academy of Sciences of the United States of America* 117, no. 50 (2020): 31706–15, <https://doi.org/10.1073/pnas.2010115117>.

223. Anna Starostinetskaya, "Interest in Veganism Hits All-time High in 2020, Google Trends Report Shows," *VegNews*, September 15, 2020, <https://vegnews.com/2020/9/interest-in-veganism-hits-all-time-high-in-2020-google-trends-report-shows>.

224. *Vegan 2020*, 2020

225. Australian Biosecurity Cooperative Research Centre for Emerging Infectious Diseases, *Delivering Benefits to Australia*, (Brisbane: Biosecurity Operation Pty Ltd, 2010), 155.

nation's biosecurity preparedness "in particular with respect to foot-and-mouth disease" that will report in December 2022.²²⁶

Concerns may be well-founded. For while the human population was protecting itself against the coronavirus with face masks, disinfection routines, and social distancing during the COVID-19 pandemic, Australian livestock was being transported live over long-haul journeys in highly unhygienic conditions. Despite challenges to provide quality medical help to people who fall sick with the coronavirus, veterinary care is only symbolic at saleyards and farmers' markets, and on live export vessels. On live export ships there is one veterinarian per 50,000–100,000 sheep. Vessels are not cleaned on a regular basis; they are cleaned only after livestock have been offloaded at the port of arrival. During the journey, livestock live in their excreta. Ammonia liberated from excreta appears to burn the eyes and throats of the animals.²²⁷

The live export industry has all the requisite attributes for becoming potentially a source of a major zoonotic disease. As warned by a conglomerate of the world's major health and agriculture organisations in 2004,²²⁸ two of the main factors contributing to possible outbreaks of new zoonotic diseases are:

- Increased demand for animal-based proteins which promotes the demand for live animals to satisfy the appetite of the rich and those who can afford to buy the high quality Australian livestock; and Global trade: the live exports continue to operate in a globalized economy; this globalization also makes it easier for pathogens to be transmitted across different geographic locations.

CLIMATE CHANGE

At the time of writing, the five-yearly state of the environment report co-authored by leading Australian scientists²²⁹ comprised a report card so damning that the incumbent government did not make it public before standing for re-election in the 2022 federal poll. 2019 was Australia's warmest year on record. Combined with deforestation (including bushfires), Australia has already seen the convergence of a number of factors that increase the risk of zoonotic spillover events. This includes the alteration of species' distribution and population dynamics due to rising temperatures and land clearing, while "[t]he geographical range of various agricultural activities has also moved in response to climate change,"²³⁰ creating new patterns of interactions between wild and farmed species. A recent study suggests that flying foxes may migrate to Tasmania, which has not previously been home to the "megabat" species

226. Rural and Regional Affairs and Transport References Committee, "Inquiry into the Adequacy of Australia's Biosecurity Measures and Response Preparedness, in Particular with Respect to Foot-and-Mouth Disease," Parliament of Australia, accessed September 14, 2023, https://www.aph.gov.au/Parliamentary_Business/Committees/Senate/Rural_and_Regional_Affairs_and_Transport/FMDBiosecurity.

227. Yu Zhang, Allan T. Lisle, and Clive J. C. Phillips, "Development of an Effective Sampling Strategy for Ammonia, Temperature and Relative Humidity Measurement During Sheep Transport by Ship," *Biosystems Engineering* 155 (2017): 12–23, <https://doi.org/10.1016/j.biosystemseng.2016.11.010>.

228. World Organisation for Animal Health (WHO, FAO, OIE), Report of the WHO/FAO/OIE Joint Consultation on Emerging Zoonotic Diseases (Geneva: Food and Agriculture Organization of the United Nations [FAO], World Health Organization [WHO], and World Organisation for Animal Health [OIE], 2004), https://apps.who.int/iris/bitstream/handle/10665/68899/WHO_CDS_CPE_ZFK_2004.9.pdf.

229. "Australia: State of the Environment, 2021," Australian Government, accessed September 14, 2023, <https://soe.dceew.gov.au: State of the Environment, 2021, Australian Government, accessed September 14, 2023,>

230. "Climate: Environment: Temperature" in Australia: State of the Environment, 2021, Australian Government, accessed September 14, 2023, <https://soe.dceew.gov.au/climate/environment/temperature>.

that carry HeV.²³¹ Although they are not known to carry viruses that are zoonotic, the white ibis and brush turkey have changed distribution in large numbers, visibly colonizing suburban and inner urban spaces in large cities like Sydney.

The State of the Environment report noted that while land clearing accounts for 40–50 Mt of CO₂ emissions annually in most years since 2010, this has been offset by the regrowth of plantation land after harvesting and by land being converted to forest.²³² According to the report, deforestation, mostly in tropical regions, was offset by regrowth on agricultural land. Nevertheless, while this might appear to be an improvement on previous years, exemptions permitted by the Queensland state Government under amendments to the Vegetation Management Act 1999 (Qld) contain loopholes that “will continue to allow significant clearing of native vegetation.”²³³ The conflicts between industry, agricultural land-holders and conservationists is not unique to Australia, and the decline of tropical forests which took place over centuries across the globe²³⁴ accelerated after World War II in Australia, as it did elsewhere.²³⁵ But given that Queensland has 39% of Australia’s forests within its borders, its government’s concessions to the agricultural industry are not trivial. Farmers are the legal custodians of approximately half of Australia’s land mass,²³⁶ and the result in New South Wales is that land clearing has continued to increase since 2017, after vegetation clearing laws were relaxed.²³⁷ Regional Forest Agreements are compromise agreements that reflect state and Commonwealth power-sharing in the area of land management. These Agreements have begun to be renewed for terms of as long as a decade, without the deforestation caused by the devastating bushfires being taken into account in the renewal and renegotiation. Forests are more degraded at the time of writing, than when the Regional Forest Agreements began,²³⁸ and it remains to be seen whether the new federal Government will have the political will to make good on its mandate to meet the challenge of climate change in line with community expectations.

Conclusion

Reducing livestock-driven deforestation and preserving natural habitat for wildlife are essential in putting a stop to biodiversity loss. Further, the welfare and biosecurity risks to animals within saleyards make a strong case for replacing these entirely with online sales. This would limit any transfer of diseases and avoid the welfare problems of exposing animals to further stress after transportation. Herding livestock together into densely packed trucks and pens, and exporting cattle and sheep over long distances by sea alive, are cruel and high-risk practices that need to be independently regulated

231. Donna Lu, “Extreme Weather May Drive Flying Foxes to Seek ‘Climate Refuge’ as Far South as Tasmania,” *The Guardian*, May 20, 2021, <https://www.theguardian.com/environment/2021/may/21/extreme-weather-may-drive-flying-foxes-to-seek-climate-refuge-as-far-south-as-tasmania>.

232. “Pressures: National Greenhouse Gas Emissions” in *Australia: State of the Environment*, 2021. <https://soe.dccceew.gov.au>

233. Evgeny Guglyuvatyy, *Climate Change, Forests and Federalism* (Singapore: Springer, 2022), Guglyuvatyy, 2022, pp 74–54 and generally, chapter 4.

234. Since European settlement, Australia’s native forests have declined by almost 40%: Evgeny Guglyuvatyy, *Climate Change, Forests and Federalism* (Singapore: Springer, 2022), Guglyuvatyy, 2022, p 63.

235. Egan, series editor, *History for a “Sustainable Future”* in Brett M. Bennett, *Plantations and Protected Areas: A Global History of Forest Management (History for a Sustainable Future, Book 3)*, (Cambridge: MIT Press, 2015), ix.

236. Australian Government Productivity Commission, *Regulation of Australian Agriculture: Productivity Commission Inquiry Report 79* (November 15, 2016): Productivity Commission (2017) p 49.

237. Evgeny Guglyuvatyy, *Climate Change, Forests and Federalism* (Singapore: Springer, 2022), Guglyuvatyy, 2022, p 68.

238. Evgeny Guglyuvatyy, *Climate Change, Forests and Federalism* (Singapore: Springer, 2022) Guglyuvatyy, 2022. See p. 70 for an account of court action lodged by “citizen scientists” in March 2020 to protect Victoria’s Central Highlands.

through the Australian Government without political pressure from the livestock industry.

The livestock and meat processing industries pose enormous challenges and threaten public health and environmental wellbeing. Significant changes in cultural attitudes toward animals are required to motivate formal regulatory reforms. For example, disassociating the Australian identity from meat production and consumption and associating even more strongly with appreciating and preserving Australia's wealth of pristine natural environments and beautiful scenery could shift governments to protect the latter over the former.²³⁹

It is true that food production has contributed significantly to the Australian economy. The enterprises have been built, in part, on labour from outside of Australia working temporarily in the sector on short-term visas. The Covid-19 pandemic largely prevented these workers from entering Australia, making labour availability a serious problem in the sector. This could be solved in part by the fact that the future requires restricting any further expansion of this sector — in fact, contracting it and replacing many animal-based foods with plant alternatives is important for climate improvement. CSIRO estimates this market to be worth \$4 billion by 2030.²⁴⁰ A recent report also shows that the demand for meat alternatives increased by 46% in 2020 in Australia and that the number of companies making such products has almost doubled.²⁴¹

Such a shift would result in better living conditions for the existing livestock herds and flocks and better environmental and health outcomes.²⁴² This is in line with the “One Health” approach, which prioritizes the links between people, animals, and their natural environment.²⁴³ One Health also recognizes the links between and interdependence of human and nonhuman animal health. Such an approach also aims at improving the condition of the ecological systems on the planet.²⁴⁴

Although land clearing and agricultural conversion, together with greenhouse emissions from food systems, now form part of the global sustainability and climate change agenda, and a new federal Government has recently been elected with an environmental mandate, the wellbeing of farm animals is yet to attract the attention it deserves. The sustainability agenda—as represented by the UN Sustainable Development Goals, and climate change negotiations (as epitomized by the work of the Intergovernmental Panel on Climate Change) —remain highly anthropocentric and to a large extent exclude other species living on this planet. As demonstrated, the continuing disregard for the well-being of farm animals has myriad serious implications for biosecurity. For many reasons, the injustice carried out in relation to livestock animals who have served the human species for millennia²⁴⁵ needs to be stopped and assigned to the past.

239. Regarding Australian meat consumption and national identity, see for example: Stewart Lockie, “Food, Place and Identity: Consuming Australia's ‘Beef Capital,’” *Journal of Sociology* 37 no. 3 (2001): 239–55.

240. CSIRO, “Growth Opportunities for Australian Food and Agribusiness,” *Food Frontier*, September 4, 2019, <https://www.foodfrontier.org/resource/growth-opportunities-for-australian-food-and-agribusiness/>

241. ABC News, 2021

242. Walter Willett et al., “Food in the Anthropocene: The EAT–Lancet Commission on Healthy Diets from Sustainable Food Systems,” *The Lancet* 393, no. 10170 (2019): P447–92, [https://doi.org/10.1016/S0140-6736\(18\)31788-4](https://doi.org/10.1016/S0140-6736(18)31788-4).

243. Margot Stuchin, Catherine C. Machalaba, and William B. Karesh, “Vector-borne Diseases: Animals and Patterns,” in *Forum on Microbial Threats, Board on Global Health, Health and Medicine Division, National Academies of Sciences, Engineering, and Medicine, Global Health Impacts of Vector-borne Disease: Workshop Summary* (Washington DC: National Academies Press, 2016), <https://www.ncbi.nlm.nih.gov/books/NBK390438/>.

244. Chris Degeling, Zohar Lederman, and Melanie Rock, “Culling and the Common Good: Re-evaluating Harms and Benefits Under the One Health Paradigm,” *Public Health Ethics* 9, no. 3 (2016): 244–54, <https://doi.org/10.1093/phe/phw019>.

245. C. J. C. Phillips and M. Wilks, “Is There a Future for Cattle Farming?” in D. Bogueva et al. (eds.), *Environmental, Health and Business Opportunities in the New Meat Alternatives Market* (Hershey: IGI Global, 2019).

One way to achieve this is for farm animals to be given a legal status as individuals or juristic persons, and hence legal protection as sentient beings. If we have been able to do this for corporations that are considered “legal persons” but do not have feelings and cannot experience pain and suffering, we should be able to do this for farm animals and recognize that they have rights—including the right to exist in dignity and without suffering. There is ample evidence about the sentience of farm animals, and in some cases their intelligence exceeds that of human infants. Farm animals deserve to have legal status and protection in a similar way to how we look after the young and socially disadvantaged members of the human species. Livestock should not be treated only as food providers. Animals need to be granted a personhood status as a vessel to impose responsibility on a legal person, be it from the livestock industry or other responsible body. Without such a legal status, the cruelty of live exports is unlikely to be contained.

The sustainability agenda is a manifestation of a new global ethics.²⁴⁶ Animal welfare should be part of this ethical framework and protection of livestock should be an independent thread from human rights within the current legal framework. It is time to close the gap between human and nonhuman animals in the eyes of the law.²⁴⁷ Looking into the future, all animals should be part of a broader species’ rights ethical legal framework in which countries negotiate their civil and trade relationships on behalf of all sentient beings. Such a move will guarantee greater animal welfare on par with the current global sustainability initiatives seeking dignity and wellbeing for all human beings.

246. A. Nagy and D. Marinova, “Leave No One Behind Not Even the Animals: Implications for the New Meat Alternatives,” in D. Bogueva et al. (eds.), *Environmental, Health and Business Opportunities in the New Meat Alternatives Market* (Hershey: IGI Global, 2019), 297–318.

247. Steven M. Wise, “Legal Personhood and the Nonhuman Rights Project,” *Animal Law* 17, no. 1 (2010): 1–11, https://www.animallaw.info/sites/default/files/lralvol17_1_1.pdf.