Veterinary Parasitology 285 (2020) 109234

Contents lists available at ScienceDirect

Veterinary Parasitology

journal homepage: www.elsevier.com/locate/vetpar

A review on *Trichinella* infection in South America

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ARTICLE INFO

Keywords:
Trichinella
trichinellosis
human cases
domestic animals
wild animals
South America

ABSTRACT

Trichinella spp. causes human trichinellosis by means of the consumption of raw or inadequately treated meat from domestic or game animals. In the Americas, as well as in other continents, *Trichinella* infection is a health issue for humans and has a negative impact on the pork meat market, generated by people's fear of becoming infected with the parasite. The distribution of human cases and the sources of this disease in humans and animals were analysed in this report, which summarizes the information available regarding *Trichinella* infection in animals and humans in South America. Within South America, human infection with *Trichinella* was documented in Argentina and Chile during the period 2005-2019. Trichinellosis is endemic in these countries for, with human cases and foci in domestic and wild animals. In Argentina, human cases occur throughout the country, with foci found in pigs and wild animals. In Argentina, during the period 2012-2018, the number of suspected human cases reached 6,662. *T. spiralis* was identified in one South American sea lion (*Otaria flavescens*) from Patagonia, Argentina, for the first time in the region in 2018. In Chile, 258 human cases of trichinellosis were confirmed during the period 2005-2015; out of those 258 cases, most samples which tested positive for *Trichinella* spp. (29.5%) were detected in the Metropolitan district (Santiago de Chile and outskirts), and 17.4% in The Lake district. Regarding age brackets, people between 30-49 years of age showed the most cases (40.1%). In Brazil, the infection is absent in domestic species but it has been found in wild boars (*Sus scrofa*) but limited to one or more region of the country. Within the animal species destined for food in South America, those that showed higher parasitical loads were pigs and wild boars, while armadillos (*Chaetophractus villosus)* and peccaries *(Tayassu tajacu)* showed very low *Trichinella* spp. larvae loads (0.04 - 0.1 larvae/g). Antibodies against *Trichinella* spp. have been detected in pigs from Ecuador and Bolivia. In Bolivia, antibodies were also found in humans. Peru, Colombia and Uruguay have no documented presence of *Trichinella* spp. in animals and humans. There is insufficient information regarding the presence of *Trichinella* spp. in domestic and wild animals, as well as in humans, since only a very limited number of surveys have been carried out. No papers with information on *Trichinella* spp. circulating in animals or humans have been published regarding the situation in Guyana, Surinam, French Guiana, Venezuela and Paraguay. Considering the growth of the guinea pig meat market in the Andean region, and the high prevalence of the disease reported in free range pigs and wild boars, as well as other game animal species, it is important to focus on the role of biosecurity and risk management, while improving meat market regulations, and detection of infection prior to consumption, in order to reduce the risk of transmission of this zoonotic disease to humans.

1. Introduction

Trichinella spp. causes human trichinellosis by means of the consumption of raw or inadequately treated meat from domestic or game animals. Traditionally, control of this parasite in host animals and their meat has been carried out at some point within the food chain, e.g.

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https://doi.org/10.1016/j.vetpar.2020.109234

Received 11 December 2019; Received in revised form 29 August 2020; Accepted 31 August 2020

Available online 4 September 2020

0304-4017/

biosecurity in farms and inspection during slaughter (FAO/WHO, 2014). Although trichinellosis is endemic in many regions of the world, the predominant impact on humans relates primarily to acute outbreaks following consumption of infected raw meat products, in several countries, namely Argentina, China, Laos, Papua New Guinea, Romania and Vietnam (Korhonen et al., 2016).

Worldwide, encapsulated and non-encapsulated clades have been described in literature (Korhonen et al., 2016; Sharma et al., 2020). *T. spiralis*, *T. nativa, T. nelsoni*, *T. britovi*, *T. murrelli*, *T. patagoniensis*, and *T. chanchalensis* (a new species from north western Canada recently described in wolverines, *Gulo gulo)*, as well as the genotypes *Trichinella* T6, T8 and T9 are in the first group, while *T. pseudospiralis*, *T. papuae* and *T. zimbabwensis*, are in the second group.

In the Americas, as well as in other continents, *Trichinella* infection is a health issue for humans and has a negative impact on the pork meat market, generated by people's fear of becoming infected with the parasite (Betti et al., 2014; Ortega-Pierres et al., 2000). The purpose of this review is to summarize the information regarding *Trichinella* infection in animals and humans in South America.

2. Material and Methods

The data this paper is based on was obtained from different sources available in South America. We searched for studies that were published between January 2005 and November 2019. Searches were completed in August 2019 using Google Scholars (https://scholar.google.com), Scopus (https://www.scopus.com) and Pubmed (https://www.ncbi.nlm.nih.gov/pubmed/), and were restricted to articles in Spanish, Portuguese, and English. Search terms included "*trichinella*", "trichinellosis", "human", and "animal" and the country names: "Argentina", "Uruguay", "Chile", "Brazil", "Paraguay", "Bolivia", "Colombia", "Peru", "Ecuador", "Venezuela", "Guyana", "Surinam", and "French Guiana". These keywords were also used in combinations using Boolean operators. Duplicate articles found in more than one database were excluded. Published articles, epidemiological reports, theses, proceedings, posters, bulletins issued by the Health Ministry of Argentina and data from SENASA (National Agricultural Health Agency in Argentina) were included. Because the number of published papers and the information available were limited in South America, all the studies found in all three languages were included. Hence, a total of twenty-seven studies regarding the presence of *Trichinella* in humans and animals in South America were collected and compiled herein.

3. Results

3.1. Argentina

The disease has spread throughout the country, given the fact that foci of *Trichinella* spp. infections are found in domestic and wild animals, as well as in humans. During the period 2012-2018, suspected cases of trichinellosis in humans amounted to 6662 in Argentina (Anonymous, 2019) (Fig. 1). In 2018, the number of cases per 100,000 inhabitants showed that the provinces with the highest prevalence were: San Luis (19.97), Córdoba (14.98), Mendoza (9.64), Santa Fe (2.7) and Buenos Aires (1.33) (Anonymous, 2019) (Fig. 2), while the pig population reached 261,930, 1,221,412, 43,835, 782,267, and 1,257,320 animals, respectively (SENASA, 2019).

Ever since the first detection in rats and humans at the beginning of the 20th century (Ribicich et al., 2005), four *Trichinella* species have been isolated in Argentina: *T. spiralis, T. patagoniensis, T. pseudospiralis* and *T. britovi* (Krivokapich et al., 2008, 2015, 2019). *T. spiralis* has been detected in pigs, wild boars (*Sus scrofa*), dogs, cats, armadillos (*Chaetophractus villosus*), cougars (*Puma concolor*), opossums (*Didelphis albiventris*), rats (*Rattus norvegicus*), and in South American sea lions (*Otaria flavescens*) (Krivokapich et al., 2006; Ribicich et al., 2010; Castaño Zubieta et al., 2014; Kin, 2015; Pasqualetti et al., 2018). *T. patagoniensis*

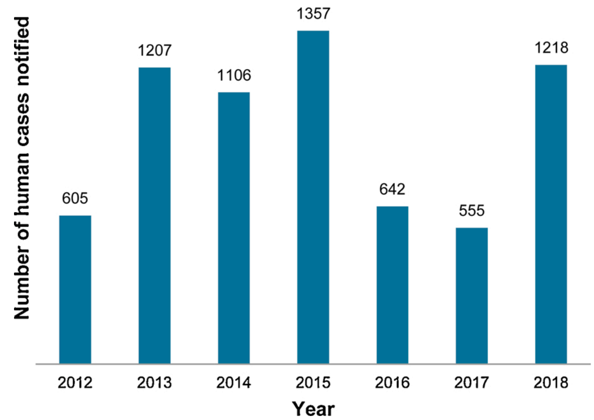

Fig. 1. Annual number of notified human cases of trichinellosis in Argentina during the period 2012-2018.

has been found only in cougars from provinces in the western region. Moreover, trichinellosis in humans has been suspected in patients involved in the consumption of *T. patagoniensis* infected cougar meat (Krivokapich, personal communication).

The number of *Trichinella* spp. foci infections in domestic pigs during the 2010-2018 period was 442 (SENASA, 2019). Since 2013, when registration of wild foci started, 84 foci were reported in wild boars and cougars (2013-2018) (SENASA, 2019).

T. pseudospiralis was detected in one domestic pig in the province of Santa Cruz, (51°37′S, 69°13′W) in September 2013. In that farm, samples from 315 pigs out of a herd of 350 animals reared outdoors were tested for *Trichinella* using a routine testing method, and one sow (about 6 years old) was found to be positive (Krivokapich et al., 2015). In July 2012, 15 patients apparently became infected through consumption of *Trichinella* contaminated sausages, bacon and/or ham in the city of Las Heras, Mendoza, Argentina (32°51′S, 68°50′W). The sausage sample was positive for *Trichinella*, with a parasite load of 4 larvae/g. Molecular identification by multiplex PCR showed a pattern of two bands of 127 bp and 253 bp corresponding to *T. britovi* (Krivokapich et al., 2019) (Fig. 3).

A study in the northeastern region of Patagonia in Argentina was conducted to evaluate the presence of *Trichinella* spp. in carnivorous and/or scavenger wild vertebrates, such as birds, mammals and reptiles. Skeletal muscle samples from 141 dead animals, which were found on roads, were analysed using artificial digestion (AD). None of the 141 samples were positive for *Trichinella* spp. larvae (Winter et al., 2018). Between 2014 and 2018, 423 wild boar carcasses were collected and analysed using AD. From these animals, 304 muscle juice samples and 125 serum samples were obtained. Muscle juice samples were tested using an indirect *Trichinella* ELISA (PrioCHECK®), while serum samples were tested using an indirect multi-species *Trichinella* ELISA (IDScreen® IDVet). Wild boar muscle samples were negative for *Trichinella* spp. Antibodies for *Trichinella* spp. were detected in 5 meat juice samples (1.64%; 95% CI 0–3.24) and in 3 serum samples (2.4%; 95% CI 0.42–4.38) (Table 1) (Winter et al., 2019).

3.2. Bolivia

In a study performed by Macchioni et al. (2012), none of the 65 pig muscle samples analysed using AD tested positive for the presence of *Trichinella* larvae. Concerning the serological investigation, 6 out of the 255 serum samples examined tested positive using ELISA kits (with an overall sero-prevalence of 2.3 %). Indirect *Trichinella* ELISA (PIGTYPE ® *Trichinella* Ab) detected two positive results in 51 pig sera samples collected in Bartolo, Bolivia and one positive result in 20 sera samples from Monteagudo, Bolivia; on the other hand, indirect multi-species *Trichinella* ELISA (ID Screen®) detected three positive sera results in 128 sera samples collected in Chuquisaca, Bolivia (Table 1).

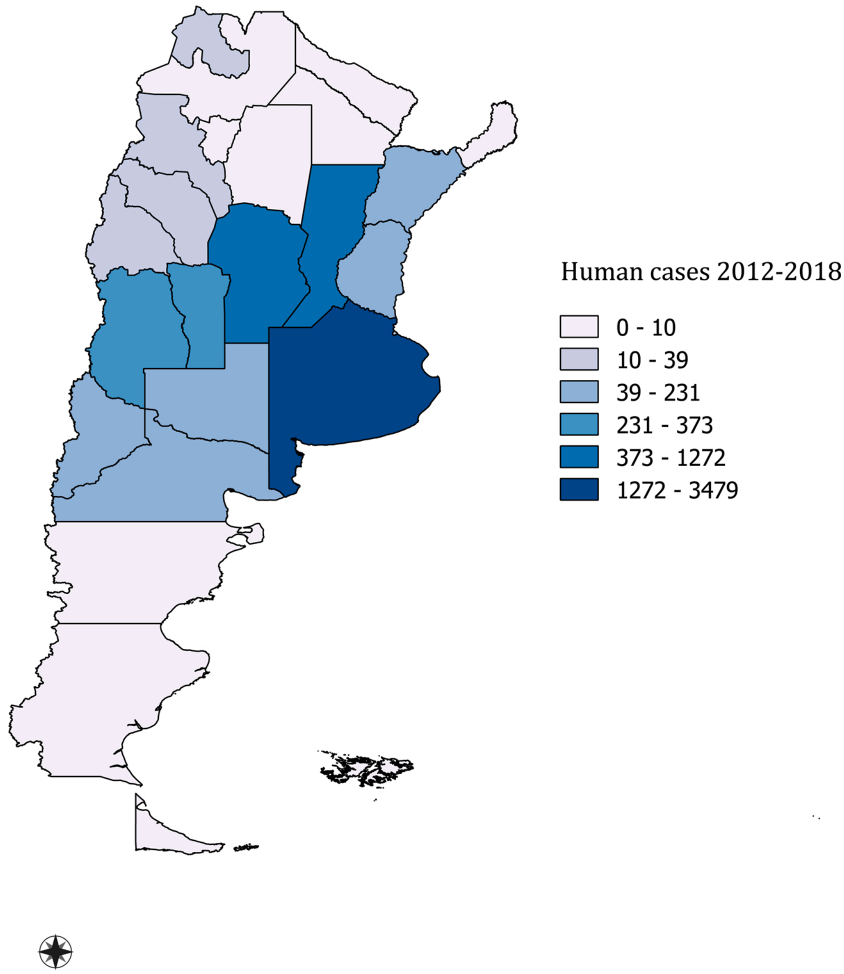

Fig. 2. Geographical distribution of notified human cases of trichinellosis in Argentina during the period 2012-2018.

There is no available information regarding human cases in the 2005-2019 period. Besides, there is insufficient information regarding the *Trichinella* spp. circulation in Bolivia.

3.3. Brazil

Published data regarding samples from pigs indicated that 15,784 animals tested negative. One-hundred g of masseters, tongue and diaphragm samples from 9,520 pigs with an average weight of 110 kg were analysed using AD at slaughter between 2009 to 2011 from abattoirs located in the northwest of the state of Paraná, (de Oliveira Souza et al., 2013). In Palmas, state of Paraná, 6,264 adult pig samples from 100 g of masseters, tongue, and diaphragm were analysed using AD in the 2002-2005 period; all the animals tested negative (Daguer et al., 2005, 2006).

The results of the tests for *Trichinella* spp. in masseters from 14,852 horses in Minas Gerais, Goias and Bahia were negative; this study was carried out between 2014 and 2016 in an abbatoir in Araguari, state of Minas Gerais, under federal inspection (Fernandes Neto Salazar and Salotti-Souza, 2017).

In another study, 24 out of 554 animals tested positive using indirect *Trichinella* ELISA (IDEXX xChek®) on wild boars caught in the states of São Paulo, Mato Grosso, Mato Grosso do Sul, Rio Grande do Sul and Santa Catarina between 2012 to 2016 (Santiago, 2017) (Table 1).

There is no documented information related to the presence of *Trichinella* infection in humans In Brazil.

3.4. Chile

In Chile, 258 cases of trichinellosis were confirmed in humans in the period 2005-2015, where the largest proportion of samples that were positive for *Trichinella* spp. (29.5%) was detected in the Metropolitan district (Santiago de Chile and outskirts), and 17.4 % in The Lake district (southern Chile). Among human cases, the most affected age bracket was people between 30 - 49 years of age (40.1%). Regarding seasonality, there was an increase in human cases of trichinellosis in winter and spring, which was associated to Mapuche celebrations (Anonymous, 2015).

Two-hundred and seventy-eight wild boars from La Araucanía and Los Ríos were analysed using trichinoscopy and AD in the 2009-2014 period. Five animals tested positives for *Trichinella spp.* with both techniques, representing an infection prevalence of 1.8% (5/278). The band patterns obtained using ISSR-PCR in 100% of the positive samples (n = 445) coincide with the positive control for *T. spiralis* (Hidalgo et al., 2019). Rodriguez Tapia (2014) published a prevalence of 10% in rats (n = 40) from the districts of Paillaco and La Union in 2014. *T. spiralis* was detected in one cougar in the Biobío Region in Las Canteras, Quilleco district, (Landaeta-Aqueveque et al., 2015) (Table 1).

In conclusion, trichinellosis is considered an endemic zoonosis in Chile. Anti-*Trichinella* antibodies have been found in humans. Up to now, only *T. spiralis* has been detected in animals (Anonymous, 2015; Landaeta-Aqueveque et al., 2015; Hidalgo et al., 2019) (Fig. 3).

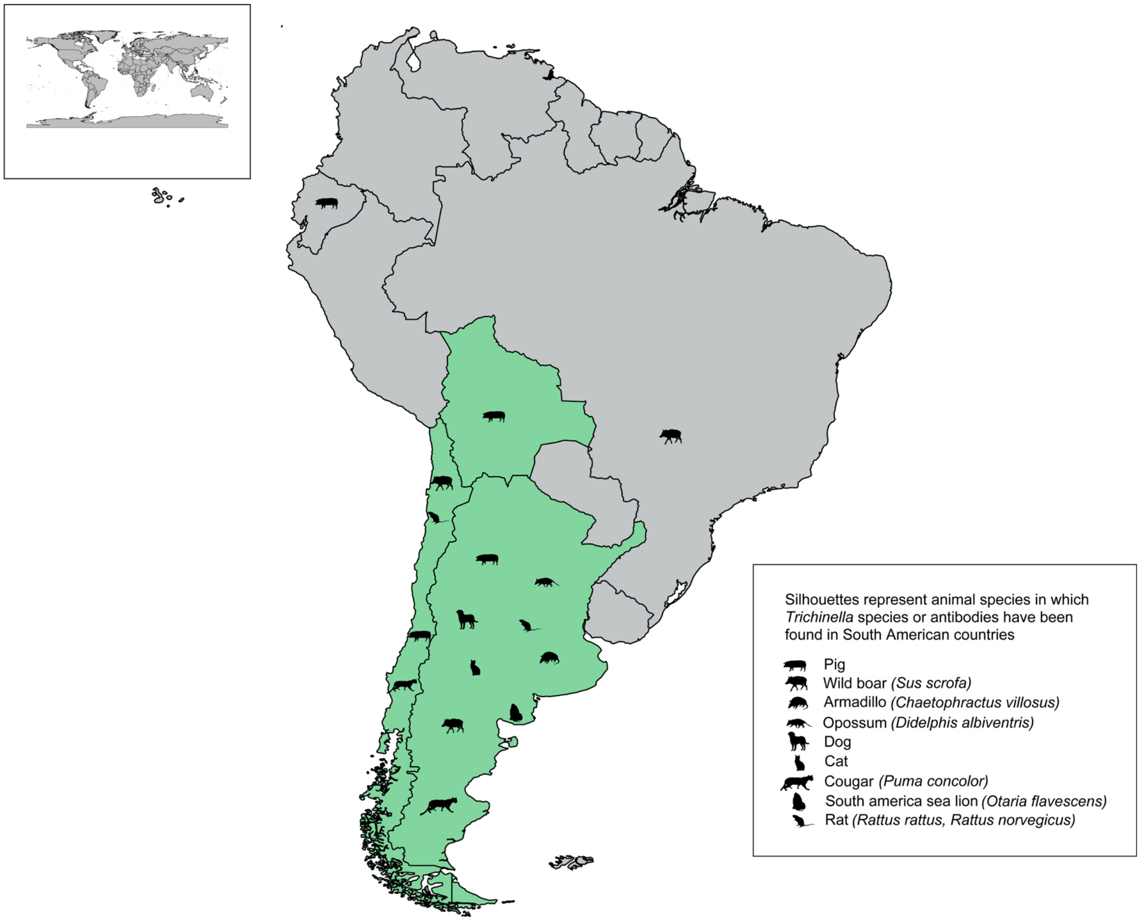

Fig. 3. Records of *Trichinella* spp. from domestic and wild animals in South America.

3.5. Colombia

During 2014-2016, 1,773 samples from swine herds in 10 states across Colombia were analysed by means of AD and ELISA, while 550 samples from *R. norvegicus* and *Rattus rattus* were tested using AD. No *Trichinella* spp. larvae infections were detected in any of the pigs or rats tested (Chaparro-Gutiérrez et al., 2018). One hundred and ninety-four pig diaphragms, which were analysed using trichinoscopy at abattoirs in the Municipality of Bello in 2009, tested negative (Laverde Trujillo et al., 2009) (Table 1).

Documented information regarding the presence of *Trichinella* infection in animals and humans is scarce in Colombia.

3.6. Ecuador

During the 2000-2003 period, three studies were conducted in indoor and free range pigs from the northern and southern Andes and Coastal areas, in the Ecuadorian Amazon region. Serum samples were analysed using ELISA, and the results revealed a prevalence of 0% in 331 pigs, and 0.35% in another 2,000 indoor raised pigs, while the prevalence in 646 free roaming pigs was 5.72%. Animal muscle samples were tested using AD and trichinoscopy; *Trichinella* larvae were not recovered from any of the samples analysed. Using an indirect in-house ELISA, this study demonstrated the presence of specific antibody responses to *Trichinella* spp. in pigs in Ecuador. However, the presence of the parasite could not be confirmed by means of parasitological methods (Chávez-Larrea et al., 2005). None of the 720 samples taken from pig diaphragmatic muscle tested positive in an AD survey carried out at Quito's Metropolitan Public abattoir (Shuguli Estupiñan, 2018) (Table 1).

There is insufficient information regarding the presence of *Trichinella* spp. in domestic and wildlife animals and humans in Ecuador. Further studies need to be conducted.

3.7. Peru

The presence of *Trichinella* was researched in backyard reared pigs in Lima between July 2011 and March 2012. Serum samples were evaluated using an indirect *Trichinella* ELISA (IDEXX POURQUIER®) for the detection of *T. spiralis* antibodies, and muscle samples were evaluated using trichinoscopy. A total of 185 animal samples tested negative, using both ELISA and trichinoscopy (Arrese et al., 2014) (Table 1).

There is no available information on *Trichinella* spp. infection in wildlife and humans in Peru.

3.8. Uruguay

Research sampling was conducted in hunting events in 7 districts in Uruguay between 2011 and 2017. One hundred and fifty-six wild boar diaphragms were analysed using AD on samples from hunting events, and they all tested negative (Altuna et al., 2018) (Table 1). No cases have been found or reported in humans since 1979 (Altuna, personal communication).

Although Uruguay is very close to Argentina and shares similar cultural habits such as eating raw pork products, to this day there are no documented reports of *Trichinella* in animals or humans.

3.9. Remaining countries

No published information was available from Guyana, Surinam, French Guiana, Venezuela or Paraguay.

Table 1
Summary of documentation with studies and reports in domestic and wild animals from South America tested for *Trichinella* spp.

Country	Year	Animal species	Test used	AD and ELISA results (n = number of tested animals; %= percentage of positive animals)	PCR results	Reference
		Foxes *(Dusicyon* sp.)	AD and PCR	AD: n = 2; % = 0		
		Rats *(Rattus* sp.)		AD: n = 8; % = 37.5		
		Cats		AD: n = 1; % = 100		
	1996-	Dogs		AD: n = 2; % = 100		
Argentina	2005	Hares *(Lepus europaeus)*		AD: n = 1; % = 0	*T. spiralis*	Krivokapich et al., 2006
		Armadillos *(Chaetophractus villosus)*		AD: n = 11; % = 63.63		
		Cougars (*Puma concolor*)				
		Pigs		AD: n = 1; % = 0		
				AD: n = 164; % = 59.14		
	2004	Cougars (*P. concolor*)	AD and PCR	AD: n = 1; % = 100	*T.* T12	Krivokapich et al., 2008
		Cougars *(P. concolor)*	AD and PCR	AD. n = 1;% = 100		
		Opossums *(Didelphis albiventris)*		AD: n = 36; % = 0		
		Armadillos *(C. villosus)*		AD: n = 19; % = 15.7		
		Capybaras *(Hydrocaeris hydrocaeris)*		AD: n = 9; % = 0		
		Foxes *(Lycalopex gymnocercus)*				
		Coypus *(Myocastor coypus)*				
	2005-	Skunks *(Conepatus chinga)*		AD: n = 3; % = 0		
	2008	Ferrets *(Galictis cuja)*		AD: n = 6; % = 0	*T. spiralis*	Ribicich et al., 2010
		Mice *(Mus musculus)*		AD: n = 6; % = 0		
		Rats *(Rattus norvegicus)*		AD. n = 2;% = 0		
		Wild boars *(Sus scrofa)*		AD: n = 6; % = 0		
		Wild cats *(Leopardus geoffroyi)*		AD: n = 66; % = 15.5		
				AD: n = 12; % = 25		
				AD: n = 3; % = 0		
	2007-2010	Armadillos *(C. villosus)*	AD and PCR	AD: n = 150; % = 25.33	*T. spiralis*	Kin, 2015
	2008-2011	Opossums *(D. albiventris)*	AD and PCR	AD: n = 61;% = 6.55	*T. spiralis*	Castaño Zubieta et al., 2014
	2013	Pigs	AD and PCR	AD: n = 315; % = 0.31	*T. pseudospiralis*	Krivokapich et al., 2015
	2014-2018	Wild boars (*S. scrofa*) (ELISA: n = 125; % = 2.4)	AD and ELISA	AD: n = 423; % = 0		Winter et al., 2019
		Opposums (*D. albiventris*)		AD: n = 15; % = 0		
		Armadillos (*C. villosus*)		AD: n = 19; % = 0		
		Foxes (*L. gymnocercus*)		AD: n = 35; % = 0		
		Skunks (*C. chinga*)		AD: n = 1; % = 0		
		Ferrets (*G. cuja*)		AD: n = 13; % = 0		
	2015-	Wild cats (*L. geoffroyi*)		AD: n = 10; % = 0		
	2017	Birds (*Macronectes giganteus, Cathartes aura, Polyborus plancus, Milvago chimango, Falco sparverius, Larus dominicanus, Sterna hirudinacea, Guira guira, Tyto alba, Athene cunicularia, Asio flammeus, Bubo virginianus*)	AD	AD: n = 37; % = 0		Winter et al., 2018
		Reptiles (*Philodryas patagoniensis*)		AD: n = 9; % = 0		
	2017	South american sea lions (*Otaria flavescens*)	AD and PCR	AD: n = 4; % = 25	*T. spiralis*	Pasqualetti et al., 2018
Bolivia	2011	Pigs	AD and ELISA	AD: n = 65; % = 0; ELISA: n = 255; % = 2.3		Macchioni et al., 2012
Brazil	2002-2004	Pigs	AD	AD: n = 3774;% = 0		Daguer et al., 2005
	2004-2005	Pigs	AD	AD: n = 2490;% = 0		Daguer et al., 2006
	2009-2011	Pigs	AD	AD: n = 9520;% = 0		de Oliveira Souza et al., 2013
	2012-2017	Wild boars (*S. scrofa*)	ELISA	ELISA: n = 554;% = 4.3		Santiago, 2017
	2014-2016	Horses	AD	AD: n = 14852;% = 0		Fernandes Neto Salazar and Salotti-Souza, 2017
Chile	2009-2014	Wild boars (*S. scrofa*)	AD and PCR	AD: n = 278;% = 1.8	*T. spiralis*	Hidalgo et al., 2019
	2012	Rats (*R. rattus*)	AD	AD: n = 40;% = 10		Rodriguez Tapia, 2014
	2014	Cougars *(P. concolor)*	AD and PCR	AD: n = 1;% = 100	*T. spiralis*	Landaeta-Aqueveque et al., 2015
Colombia	2014-2016	Rats (*R. norvegicus*, *R. rattus*) Pigs	AD and ELISA	AD: n = 550;% = 0 AD: n = 1773;% = 0; ELISA: n = 600;% = 0		Chaparro-Gutiérrez et al., 2018
	ns	Pigs	Trichinoscopy	Trichinoscopy: n = 194;% = 0		Laverde Trujillo et al., 2009
Ecuador	2000-2003	Pigs	Trichinoscopy, AD,and ELISA	Trichinoscopy and AD: n = 977;% = 0; ELISA: n = 2977;% = 1.48		Chávez-Larrea et al., 2005
	2017	Pigs	AD	AD: n = 720;% = 0		Shuguli Estupiñan, 2018
Perú		Pigs				Arrese et al., 2014

(*continued on next page*)

Table 1 (*continued*)

Country	Year	Animal species	Test used	AD and ELISA results (n = number of tested animals; %= percentage of positive animals)	PCR results	Reference
Uruguay	2011-2012 2011-2017	Wild boars (*S. scrofa*)	Trichinoscopy and ELISA AD	Triquinoscopy: n = 185; % = 0;ELISA: n = 185;% = 0 AD: n = 156;% = 0		Altuna et al., 2018

ns: not specified in the paper.
AD: artificial digestion

4. Discussion

Argentina and Chile are endemic countries, where foci of *Trichinella* spp. infections are regularly reported in domestic pigs and wild animals, as well as in humans. In Argentina, *Trichinella* spp. has been documented in domestic animals, such as pigs, synanthropic animals, such as dogs and rats, and wild animals, such as cougars, armadillos, peccaries (*Tayassu tajacu)*, and wild boars. In 2018 *T. spiralis* was detected for the first time in a South American sea lion in Caleta de Los Loros Reserve, a protected natural area located on the Atlantic coast of the province of Río Negro, Argentina. The inclusion of the South American sea lion in the wide range of *Trichinella* spp. hosts adds new information to the *Trichinella* spp. epidemiology research in marine animals in the region of Argentine Patagonia (Pasqualetti et al., 2018).

The cases of trichinellosis in humans have increased in Argentina, and the disease has spread to more provinces (Anonymous, 2019). The hypothesis that could explain this scenario may have to do with the increase in pork consumption, which has climbed from 2.5 kg/capita in 2008 to 14 kg/capita in 2017 (SENASA, 2019).

There is no published information regarding the presence of trichinellosis in humans in Bolivia during the period 2005-2019. However, Bartoloni et al. (1999) detected anti-*Trichinella* spp antibodies in 7 out of 234 rural residents of the province of Cordillera, in the Santa Cruz district, Bolivia.

No detection has been reported in domestic animals (horses and pigs) in Brazil. Therefore, the status of the disease is as follows: infection present and limited to one or more zones in wild boars, and absent in domestic species (Anonymous, 2016) (Fig. 3).

Regarding Chile, Rodriguez Tapia (2014) found that 4 out of 40 synanthropic rodents (*R. rattus)* were positive for *T. spiralis*. The author concluded that bad agricultural practices in the areas under study favoured the contact between rodents and small-scale, farm reared pigs. Furthermore, it was determined that only 12.5% of the farmers in the survey knew about Good Production Practices and the importance of *T. spiralis* detection.

In Peru, annual consumption of guinea pig meat (locally known as *cuy*) is 0.5 kg/capita. Eighteen million guinea pigs are raised yearly, and meat exports of this species have increased from 2 t in 2002 to 20 t in 2015, the USA being the main destination. It is important to monitor guinea pigs for *Trichinella* infection, considering that guinea pigs are adequate hosts for many species of *Trichinella* (Nasinyama et al. 1991; Kapel et al. 1998; Dzik et al. 2002; Leclair et al. 2004; Webster and Kapel 2005), and that *T. patagoniensis* L1 larvae can remain infective in muscle tissue for several weeks, even while undergoing decomposition (Fariña et al., 2017). However, there is no published information regarding the presence of *Trichinella* spp. circulating in animals or humans in Peru.

Antibodies against *Trichinella* spp. have been detected in pigs from Ecuador and Bolivia. Colombia and Uruguay have no documented presence of *Trichinella* species circulating in animals or humans, although there is insufficient information regarding the presence of *Trichinella* spp. in domestic, wild animals and humans, since only a very limited number of surveys has been carried out. Regarding Guyana, Surinam, French Guiana, Venezuela and Paraguay, there is no information related to *Trichinella* spp. circulating in animals or humans.

Within the animal species destined for food use in South America, those that hosted larger parasitical loads were pigs and wild boars, while armadillos and peccaries showed very low *Trichinella* spp. larvae loads (0.04 - 0.1 larvae/g). Considering the increase in the guinea pig meat market and the high prevalence of the infection reported in pigs and wild boars raised for food, as well as other game species in some regions in some countries, it is important to focus on the role of risk management and biosecurity, while improving meat market regulations, and detection of infection prior to consumption, in order to reduce the risk of transmission of this zoonotic disease to humans.

CRediT authorship contribution statement

M Mabel Ribicich: Conceptualization, Methodology, Writing - original draft, Funding acquisition. **Fernando A Fariña:** Data curation, Writing - original draft, Resources. **Tatiana Aronowicz:** Visualization, Investigation. **Mariano E Ercole:** Investigation, Resources. **Clara Bessi:** Investigation, Validation. **Marina Winter:** Resources, Investigation. **Mariana I Pasqualetti:** Writing - review & editing, Data curation.

Declaration of Competing Interest

The authors report no declarations of interest.

Acknowledgement

This work was in part supported by FONCyT. ANPCyT. PICT- 2015-2350. PICT 2015-3469. UBACyT20020170100530BA.

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