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Revisión sistemática de las zoonosis en animales domésticos y de producción documentadas en el Estado de México

Systematic review of zoonoses in domestic and production animals documented in the State of Mexico

Revisão sistemática de zoonoses em animais domésticos e de produção documentadas no Estado do México

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Resumen

Las enfermedades infecciosas zoonóticas (o zoonosis) representan graves riesgos para la salud tanto de los animales como de los humanos, lo cual puede tener impactos económicos a nivel mundial. Por eso, esta revisión tuvo el objetivo de recopilar información para analizar sistemáticamente diversas investigaciones sobre el estudio de las zoonosis presentes en animales domésticos y de producción documentadas en el Estado de México con el fin de obtener herramientas que ayuden a prevenir enfermedades que causan problemas de salud pública. Para ello, se utilizó el método Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA), aplicando diversos buscadores científicos como Google Scholar, PubMed y Scielo. La revisión se limitó hasta el 6 de noviembre de 2022. Como resultado se obtuvieron 161 artículos:

148 provenientes de Pubmed, 9 de Scielo y 4 de Google Scholar. Del total de artículos encontrados 80 fueron eliminados tras leer el título, ya que tenían correspondencia con la mayoría de las palabras clave. Posteriormente, 77 artículos fueron eliminados, ya que, al leer el resumen, se trataba de artículos de revisión o no contaban con las características solicitadas. Los artículos seleccionados para evaluar la elegibilidad fueron 6; sin embargo, se descartaron 2 debido a que fueron realizados en México, pero no eran específicos del Estado de México, y tenían más de 5 años de antigüedad. Finalmente, solo 4 artículos fueron incluidos para esta revisión sistemática.

Palabras clave: zoonosis, animales de compañía, animales de producción, salud pública.

Abstract

Zoonotic infectious diseases (or zoonoses) are communicable diseases that are transmitted from animals to humans. These diseases bring serious health risks to both animals and humans and can have high economic impacts worldwide. The objective of this systematic review has arisen from the need to collect, analyze and synthesize the knowledge of the investigations previously carried out in relation to information on the zoonoses present in domestic and production animals documented in the State of Mexico, getting tools that help prevent diseases that cause public health problems. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) method is recommended, using the Google academic, PubMed, Scielo databases, the review was limited until November 6, 2022. As a result, acquired 161 articles: 148 from Pubmed, 9 from Scielo and 4 from Google Scholar. Of the total articles found, 80 were eliminated after reading the title since it did not present agreement with most of the keywords, later 77 articles were eliminated since, when reading the abstract, they were review articles or did not have the necessary keywords. characteristics related to the inclusion criteria. The number of studies selected to assess their eligibility was 6, however, 2 were discarded because they were conducted in Mexico, but were not specific to the State of Mexico and were older than 5 years. Finally, only 4 articles were included for this systematic review.

Keywords: Zoonoses, companion animals, production animals, public health.

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Resumo

As doenças infecciosas zoonóticas (ou zoonoses) representam graves riscos para a saúde tanto dos animais como dos seres humanos, que podem ter impactos económicos globais. saúde pública. Para isso, utilizou-se o método Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA), aplicando diversos mecanismos de busca científica como Google Scholar, PubMed e Scielo. A revisão foi limitada até 6 de novembro de 2022. Como resultado, foram obtidos 161 artigos: 148 no Pubmed, 9 no Scielo e 4 no Google Acadêmico. Do total de artigos encontrados, 80 foram eliminados após a leitura do título, pois correspondiam à maioria das palavras-chave. Posteriormente, foram eliminados 77 artigos, pois, na leitura do resumo, eram artigos de revisão ou não apresentavam as características solicitadas. Os artigos selecionados para avaliar a elegibilidade foram 6; Porém, 2 foram descartados porque eram fabricados no México, mas não eram específicos do Estado do México e tinham mais de 5 anos. Por fim, apenas 4 artigos foram incluídos para esta revisão sistemática.

Palavras-chave: zoonoses, animais de companhia, animais de produção, saúde pública. _

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Introduction

Zoonotic infectious diseases (or zoonoses) are transmissible conditions that spread from animals to humans (Hubálek, 2003) and can have significant economic impacts. Transmission can occur through various routes, such as food, water, vectors such as fleas, ticks and mosquitoes, direct contact with animals (or indirectly through fomites), and environmental contamination (Bidaisee *et al.*, 2014).

At a global level, the close coexistence between humans and companion animals and livestock species is extensive. In fact, approximately 75% of emerging infectious diseases are zoonoses, although only 13 of them are considered priorities by the World Health Organization (WHO) (WHO, 2022). In Mexico, the National Institute of Statistics and Geography (INEGI) indicates that there are 27 million pets, of which 70% of dogs and cats live in neglected conditions and lack owners. This implies that only 5,400,000 have access to adequate housing and food, while the rest live in abandonment, with more than 100,000 dogs and cats entering this condition annually, of which no data is known about their health status. health (Acevedo-Ramírez and Peralta-Abarca, 2010).

In this context, domestic and production animals with owners who do not apply adequate management and prophylactic disease control can represent a serious public health and animal welfare problem (Martínez-Barbosa *et al.*, 2008). Therefore, the objective of this research was to collect information to systematically analyze various investigations documented in the State of Mexico on zoonoses present in domestic and production animals, so that strategies can be designed that contribute to their prevention.

Method

Preferred was used Reporting Items for Systematic Reviews and Meta- Analyses (PRISMA) (Page *et al.*, 2020).

Characterization of the articles

The research was explored using the scientific search engines Google Scholar, PubMed and Scielo. The review was limited to November 6, 2022 (Table 1).

Table 1. Search strategy by database

Google scholar	1. Zoonotic diseases and domestic animals in the state of Mexico. 2. Zoonotic diseases and production animals in the state of Mexico. 3. Zoonoses in the state of Mexico.
PubMed	1. Zoonotic diseases and domestic animals in the state of Mexico. 2. Zoonotic diseases and production animals in the state of Mexico. 3. Zoonoses in the state of Mexico.
Sky	1. Zoonotic diseases and domestic animals in the state of Mexico. 2. Zoonotic diseases and production animals in the state of Mexico. 3. Zoonoses in the state of Mexico.

Source: self made

Criteria to be included in the review

1. Inclusion criteria: Scientific studies in English and Spanish, studies generated by the State of Mexico, zoonoses in companion animals, zoonoses in production animals were considered.
2. Exclusion criteria: Scientific texts more than five years old, from other states of the country, reviews, with incomplete text or without abstract (*abstract*).

Procedure for compiling articles

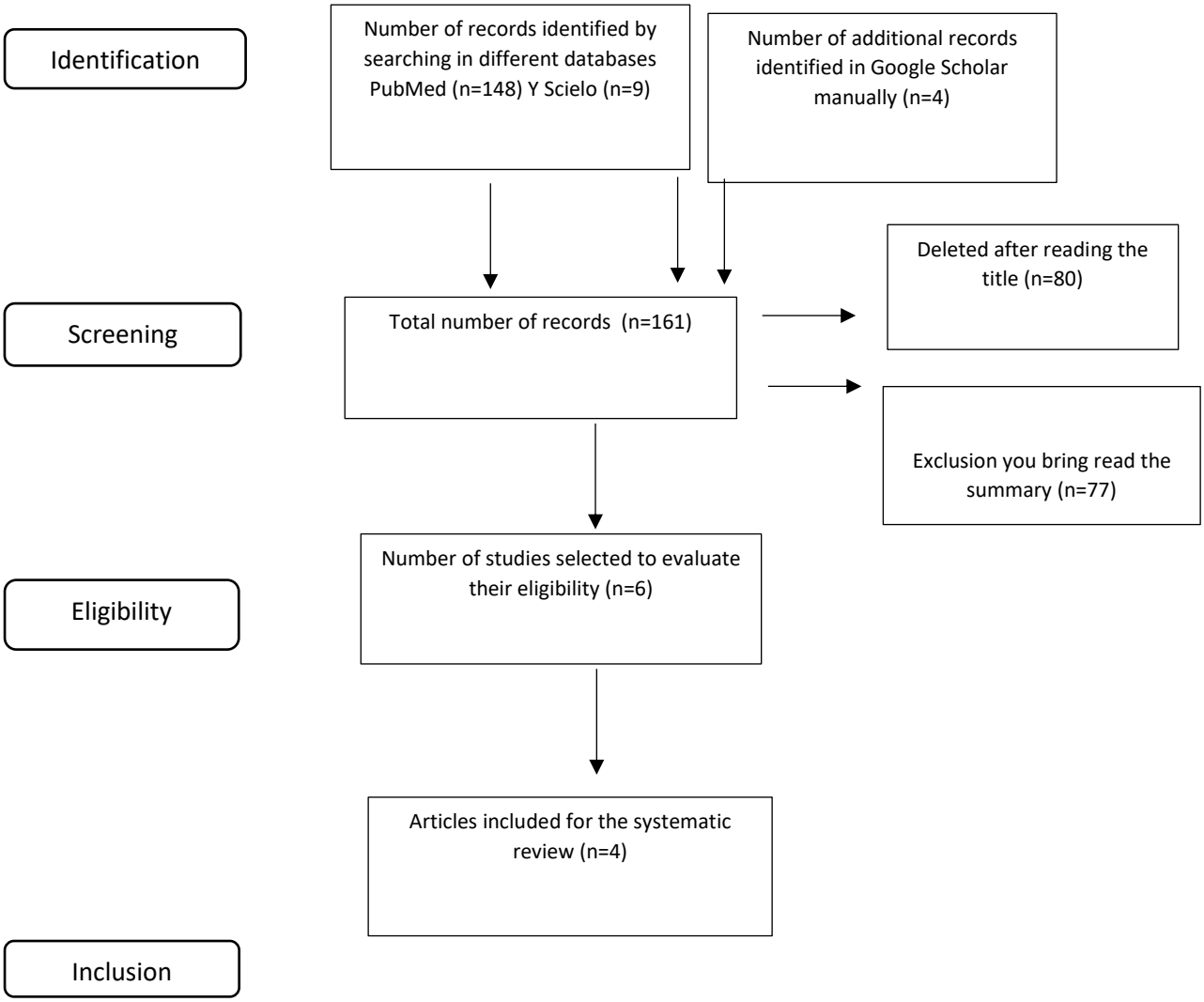
The compilation of results was carried out autonomously and is present in Figure 1. The information was recorded, such as the name of the authors, country, state, findings, and restrictions, as well as everything related to the stated objective.

Results

Based on the search strategies implemented, a total of 161 articles were collected, of which 148 came from Pubmed, 9 from Scielo and 4 from Google Scholar (figure 1). Of all the articles identified, 80 were excluded after reviewing their titles, since they did not match most of the keywords. Subsequently, 77 articles were eliminated when their abstracts were reviewed, since they were review articles or did not meet the characteristics linked to the information sought.

Of the remaining studies, 6 were selected and evaluated; However, 2 were discarded because, although they were carried out in Mexico, they were not specific to the State of Mexico and were more than 5 years old. Finally, only 4 articles were included in this systematic review, since they met the necessary elements to address the stated objective (figure 1). The results obtained indicate that zoonotic pathogens are present in both companion and production species.

Figure 1. Selection of studies with Prisma 2020 flowchart



Source: self made

Discussion

Despite the high presence of companion animals in the State of Mexico, only two studies focused on this category were identified. The research reveals the existence of specific studies in dogs (Lara-Reyes *et al.*, 2019) and cats (Rodríguez Gallegos *et al.*, 2016), focused on the analysis of parasites (table 2). Both studies highlight the importance of preventive measures, especially through deworming, and highlight the relevance of animal behaviors, such as hunting habits in cats, as well as environmental risk factors. In the case of Lara-Reyes *et al.* (2019), the presence of soil contaminated by parasites that cause digestive disorders is noted, a global problem with consequences on both animal and human health.

The objective of the study by Lara-Reyes *et al.* (2019) was to identify intestinal parasites in fecal samples from dogs in public places frequented by humans and other animals in the State of Mexico. Fecal sampling was carried out in 27 public sites, and the samples were subjected to three parasitological laboratory techniques. The results revealed that 81.4% of the public places analyzed tested positive for enteric parasites, with 81.3% of the possibility of contagion of zoonoses, highlighting species such as *Toxocara spp*. *Ancylostoma* spp. and *Giardia* spp. The study concludes that parks in the Toluca metropolitan area can represent a serious threat to public health, which is why adequate health management is required by animal owners.

On the other hand, Rodríguez Gallegos *et al.* (2016) identified *Toxocara* spp. in 42% of domestic cat feces in the State of Mexico. It was observed that the largest number of infected cats were under one year old, and males showed higher infection rates. Statistical analysis indicated an association between the age of cats younger than six months and the presence of *Toxocara eggs* in feces. The study concludes that the prevalence of *Toxocara* spp. in domestic cats in the State of Mexico is high and represents a potential risk of human toxocariasis. Both studies highlight the importance of addressing public health problems linked to parasites, given that parasitic infections cause digestive disorders, one of the main causes of medical consultations in both humans and animals globally.

For future research, consideration of the behavior of ectoparasites in the region of the State of Mexico is suggested, given the presence of climate change and population migration, factors that could lead to the spread of various diseases. Likewise, the need to implement effective control of both external and internal parasites is highlighted.

In the State of Mexico, livestock production is oriented towards sheep, and stands out for being one of the main producers of rabbit meat nationwide. Despite this, research on zoonosis problems related to production animals in the region is limited. One of the few studies found in this review was carried out by Alonso- Frensan, whose objective was to report on the prevalence of *Cryptosporidium* spp. in sheep from four commercial establishments distributed in three municipalities of the State of Mexico, during the summer season. 200 fecal samples were collected from sheep in different physiological conditions (pregnant, non-pregnant and lactating, as well as lambs under one year old), all coming from clinically healthy sheep. The research revealed an overall prevalence of 61% for this parasite. The relevance of this study lies in the importance of cryptosporidiosis as a disease with global distribution, particularly in overpopulated areas, which is why it is considered a significant zoonosis. In epidemiological studies, *Cryptosporidium* has

been identified as a common cause of diarrhea in animals and humans in global epidemiological studies.

The last study highlighted in the review is that of Reynoso Utrera *et al.* (2019), which becomes relevant due to the lack of research in the southwest area of the State of Mexico, one of the main rabbit meat producing regions. Furthermore, few studies have focused on viruses that affect livestock species using molecular techniques. This work focused on the identification of rotavirus in rabbit meat production units using the RT-PCR technique. Samples were collected from 39 production units in 13 municipalities in the eastern region of the State of Mexico. Of the 147 samples analyzed in the laboratory (99 from healthy animals and 48 from animals with gastroenteric problems), 9 of these were positive for rotavirus (18.7%). The control group of healthy animals showed negative results for this virus. This study, one of the first of its kind in eastern Mexico, shows the serious economic repercussions of rotavirus on rabbit meat production. Furthermore, it raises the possibility of an interspecies jump to humans, which means a potential zoonotic problem. In future research, the continuity of studies on viruses and other zoonoses in the region is suggested, as well as the implementation of preventive measures to protect both animal and human health.

Table 2. Articles found

Author	Year	Animal species	Pathogen	Prevention
Alonso - Fresán *et al.*	2018	sheep Production	Parasite *Cryptosporidium*	Deworming Monitoring
Reynoso *et al.*	2019	rabbits Production	Virus Rotavirus	Good livestock production practices
Lara-Reyes *et al.*	2019	Dog Animal companion	Parasites *Toxocara* spp *Ancylostoma* spp *Giardia* spp	Deworming Environmental monitoring
Rodríguez Gallegos *et al.*	2016	Cats Animal companion	Parasite *Toxocara*	Deworming Sterilization

Source: self made

Conclusion

Domestic and production animals fulfill various functions, from providing food to serving a zootechnical purpose in agriculture or serving as companion. However, the close interaction between humans, animals, and the ecosystem have a profound implication on public health, making it crucial to maintain an appropriate balance. In this sense, it is important to recognize that humans can interact with infectious agents from different animals in their environment, which increases the probability of finding a host with the necessary characteristics to trigger zoonosis problems.

In fact, in regions such as the southeastern part of the State of Mexico, there is a lack of knowledge about which zoonotic pathogens may be present in the population, since they lack monitoring and screening, which complicates their control and eventual eradication, severely impacting the population. public health. The control of zoonoses, therefore, is a global challenge, and each pathogen must be evaluated in various contexts. We are in a new era of emerging and re-emerging diseases, as evidenced by the current covid-19 pandemic. This highlights the need to strengthen epidemiological surveillance of diseases in animals and their relationship with humans, as well as to reinforce preventive health measures to detect emerging or re-emerging diseases in a timely manner.

Contributions to future lines of research

This systematic review has played a fundamental role in analyzing and synthesizing advances in the issue of zoonoses in the State of Mexico, as it provides a solid basis for the implementation of strategies aimed at mitigating these problems in animal and human populations from various sectors. However, despite the importance of the topic, there are a limited number of studies focused on the region of the State of Mexico, and a preponderance of research focused on internal parasites is observed. Therefore, the creation of new, more comprehensive lines of research is suggested that address not only internal parasites, but also aspects such as ectoparasites, vectors, viruses, and bacteria with zoonotic potential.

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