ARTÍCULO ORIGINAL

Cysticercosis occurrence and sanitary risks in groups of inspected and non-inspected swine in Brazil

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ABSTRACT

A sero-epidemiological study of swine cysticercosis was carried out in 628 swine slaughtered at seven locations in Brazil. 322 of these animals were inspected by approved meat inspectors at three locations and 306 animals were slaughtered at four different locations and were not inspected. Non-inspected swine (prevalence 16.3%) were 5.5 times more likely to be seropositive than inspected swine (3.4%) (p < 0.0001). The results of this study provide information to further understand the epidemiology of cysticercosis in Brazil.

Key words: Swine cysticercosis, meat inspection, prevalence, public health.

INTRODUCTION

Cysticercosis, a zoonosis which causes a great impact on animal and human health, is an important problem in several areas of the world, mainly in Latin American, African and Asian countries, where it is endemic. Although it occurs throughout Brazil, it is more frequent in the poor areas.1,2

Cysticercosis impact on swine and cattle production is related to economic losses, associated to food production, reaching a total annual loss of US $ 420 million in South America. Swine losses have reached a sum of US $68 million in Mexico, when occurrence was superior to 1.6%.1

Cysticercosis can cause irreversible damages in humans, which may develop into neurological manifestations, such as neuro-cysticercosis. Epidemiological data have shown that the prevalence in psychiatric patients is 12.2%, with 100 people presenting neuro-cysticercosis and 30 presenting ocular lesions out of 100,000 people in the world4,5. On the
other hand, individual damages will demand greater economic resources of laboratory and hospital services.

Despite the great impact on public and animal health as well as on the economy in Brazil, its epidemic aspect is not known since notification of its occurrence in humans is not mandatory and the number of meat inspection services is very limited in small locations. Indeed, in some brazilian places, non-inspected meat may represent up to 30% of the meat market.

A similar scenario exists for swine cysticercosis, which is considered the most important public health problem, since it may cause teniosis in humans, as the data available by the Federal Inspection Service represents only 49% of the meat sold in the country. In addition, despite the efficacy of the conventional inspection procedures, 40 to 50% of the cases may not be detected in mild infections.

Data on cysticercosis frequency may still be influenced by the type of diagnosis technique applied. In this way some authors has been obtained frequencies of 23.4%, through tongue exam, 31.2% through necropsy and 37.7% using the ELISA test.

There is no information available on its frequency in animals slaughtered without inspection, and since they are generally domestically reared, there is a greater chance of cysticercosis occurrence than in animals slaughtered under inspection, originated from intensively rearing.

Thus, given the relevance of swine cysticercosis within the human and animal health and economic contexts, as well as the need to investigate the real occurrence of this disease in Brazil, mainly including illicit slaughter practices, a study was developed to investigate the occurrence frequency, using the ELISA test in swine grouped into animals submitted or not submitted to inspection services.

MATERIAL AND METHODS

A total of 628 pigs were classified into 2 groups: group 1 - 322 animals slaughtered under inspection; and group 2 - 306 slaughtered without inspection, before sold or consumed.

Blood samples of each pig of group 1 coming from three locations (Belo Horizonte-MG, 103 samples, Carapicuíba-SP, 99 samples and Recife-PE, 120 samples); was collected: during slaughter at the moment of bleeding. The blood samples of pigs of group 2 coming from 4 rural locations (Guarapuava-PR, 68 samples, Viçosa-MG, 56 samples, Terenos-MS, 23 samples and Apodi-RN, 159 samples), were collected by puncture of the ocular vein plexus with sample distribution according to the number of swine per location.

Cysticercosis diagnosis - ELISA test

ELISA test, 3-fold for each sample, standardized at the Laboratory of Sorology of the Adolfo Lutz Institute, São Paulo-SP, Brazil, were applied to the swine serum samples. The data obtained were stored in data base, submitted to quality control, analyzed through Epiinfo, 6.04 software and distributed in tables, with the odds ratio being calculated and the Fisher or X² (Chi-square) test applied to verify significant differences at 5%.

For each odds ratio value, the respective intervals confidence 95% were calculated and for comparison among the magnitudes of the specific odds ratio values of each place, a value base, equal to 1.0, was established for the place offering the least cysticercosis risk, according to the criterium of least frequency obtained among the group 1 swine locations,
with Belo Horizonte being the selected one (frequency equal to 2.9%).

RESULTS

Table 1 shows that the overall frequency of sera reactive to swine cysticercosis using the ELISA test was 9.7%, ranging from 1.8% to 26.5%, indicating a wide frequency range by location.

<table>
<thead>
<tr>
<th>Sample origin</th>
<th>Number of samples</th>
<th>Positive samples (%)</th>
<th>Odds Ratio IC %95</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Viçosa-MG</td>
<td>36</td>
<td>01 (19)</td>
<td>0.06 (0.01-7.71)</td>
<td>0.55</td>
</tr>
<tr>
<td>Belo Horizonte-MG</td>
<td>103</td>
<td>03 (2.9)</td>
<td>1.04 (0.14-7.91)</td>
<td>0.63</td>
</tr>
<tr>
<td>Carapaxuva-SP</td>
<td>59</td>
<td>03 (3.1)</td>
<td>1.45 (0.27-9.55)</td>
<td>0.72</td>
</tr>
<tr>
<td>Teresina-PE</td>
<td>120</td>
<td>05 (4.2)</td>
<td>5.50 (0.61-39.38)</td>
<td>0.07</td>
</tr>
<tr>
<td>Apodi-RN</td>
<td>159</td>
<td>28 (17.6)</td>
<td>7.12 (2.10-37.44)</td>
<td>0.0006</td>
</tr>
<tr>
<td>Guarapuava-PR</td>
<td>68</td>
<td>18 (26.5)</td>
<td>12.0 (3.24-65.60)</td>
<td>0.0000</td>
</tr>
<tr>
<td>Total</td>
<td>628</td>
<td>61 (9.7)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*IC=Confidence interval.

This frequency difference can be seen by observing the odds ratio magnitude of each group for when considering the Belo Horizonte samples as having the lowest cysticercosis risk, one can also see that two locations present significant difference (p < 0.001): Apodi with odds ratio equal to 7.12(2.10-37.44) and Guarapuava 12.0(3.24-65.60). That means that the swine from the latter location presented a cysticercosis occurrence risk 12-fold greater than Belo Horizonte (location base).

Table 1 also points out the lowest cysticercosis occurrence in Viçosa-MG and Guarapuava-PR, indicating a very contrasting occurrence for those two locations. The odds ratio obtained for Viçosa-MG, 0.61(0.01-7.78), although not significant (P > 0.05), also shows a possible protection factor, as compared to Belo Horizonte.

To better understand this wide range of swine cysticercosis frequency detected in Table 1, a distribution of these serologic results was made, according to sample type (inspected or not inspected), as shown in Table 2. This distribution allows to verify whether there is a significant difference (P = 0.00006), between the reactive serum frequency of inspected animals and that observed in animals not inspected.

<table>
<thead>
<tr>
<th>Sample type</th>
<th>Number of samples</th>
<th>Positive samples (%)</th>
<th>Odds Ratio IC %95</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inspected</td>
<td>322</td>
<td>11 (3.42)</td>
<td>5.52 (2.76-11.99)</td>
<td>0.00006</td>
</tr>
<tr>
<td>Non-inspected</td>
<td>306</td>
<td>50 (16.34)</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>628</td>
<td>61 (9.71)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*IC=Confidence interval.

The magnitude of this difference can be evaluated through the odds ratio value 5.52 (2.76-11.99), showing that sera from non-inspected swine are 5-fold more likely to present
immunological reactivity than inspected slaughtered animals.

Another question presented in Tables 1 and 2, is if the difference found among the frequencies is restricted only to the variable inspected not-inspected, or also to the differences among the frequencies obtained by the animals in each one of these categories, separately. To better understand this question, the frequencies were distributed according to the variable inspected or not, separately in Table 3, using a different base value for each category.

This table shows that, taking into consideration the frequency obtained for Terenos-MS, 13.0%, as base value, there is no significant difference (P > 0.05) among the frequencies obtained for non-inspected swine nor among the inspected ones (P>0.05). An odds ratio magnitude drop is also observed for both groups.

Also in Table 3, it is worth noticing that the frequency obtained by Viçosa-MG swine, 1.8%, is found among the frequencies of non-inspected slaughtered animals, since this value is lower than the lowest frequency obtained from inspected slaughtered animals, what seems to indicate that a new variable should be taken into account to analyze cysticercosis frequencies in swine.

**DISCUSSION**

The results of this study using the ELISA test for swine cysticercosis diagnosis, including inspected and non-inspected animals as samples, have allowed a much clearer understanding of the occurrence of this disease in Brazil.

This is shown in Table 1, thorough the range and magnitude of the frequency values obtained (1.8% to 26.4%), as compared to those obtained from inspected service data studies carried out in Brazil by several researchers, obtaining frequencies ranging from 0.01% and 5.53%

However, it can be seen in Table 2 that the overall frequency, 3.42%, obtained in this study, among the inspected swine (group 1) is within the swine cysticercosis frequency range observed in Brazil by the mentioned researchers.

The epidemiological dimension of swine cysticercosis occurrence among illegally slaughtered and inspected animals can be seen in the data distribution on Table 2, showing a significant difference (P < 0.01) between the frequencies obtained by those two groups, whose magnitude measured through odds ratio allows to conclude that swine illegally slaughtered have a 5-fold greater risk as compared to inspected slaughtered swine, 5.52 (2.76-11.99). This should serve as a warning to the brazilian public health authorities on the unknown and worrisome epidemiological status of swine cysticercosis in Brazil, under illegal slaughtering and meat selling conditions in Brazil, reaching up to 30% of the slaughtering and meat market in some places in the country.

Table 3 results emphasize the differences among the cysticercosis frequencies found in inspected and non-inspected animals, since no significant difference (P>0.05) was found when each group was evaluated separately. This reinforces the hypothesis that there are different aspects associated to cysticercosis occurrence, determined by social-economic and cultural characteristics of the farmers and rearing practices, as evaluated by some authors.
In this sense, "inspected animals" stand for feedlot practices and farmers of a higher social-economic and cultural level, whereas animals "illegally slaughtered" originate from poor regions without environmental sanitation and are owned by farmers of a low social-economic and cultural level, who raise swine without proper inspection. This latter condition is determinant in the removal of animal suppliers to slaughterhouses controlled by inspection services, due to the possibility of economic losses for condemnation.

Differences in cysticercosis frequency and ELISA sensitivity among rural and commercially reared swine also are related. This may indicate a higher range of epidemiological data of swine cysticercosis in Brazil, detected in this study, since the sensitivity of ELISA test is lowest in rural animals, showing a frequency underestimate in this condition.

Another aspect of swine cysticercosis in Brazil demonstrated by this study, refers to swine illegally slaughtered that was raised under a feedlot system, based on the frequency obtained from swine in Viçosa-MG, 1.8%, which, although occurring among non-inspected animals, is lower than those found in inspected animals. This fact calls attention to the need to introduce technical information and small technological modifications into traditional raising, as an important measure for cysticercosis control in regions of high occurrence of this disease.

The results obtained in this study provide epidemiological information of great relevance to understanding swine cysticercosis occurrence in Brazil and should be considered for programs aiming to control this zoonosis in the country.

REFERENCES


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