OCCURRENCE OF TUBERCULOSIS IN CATTLE SLAUGHTERED UNDER SANITARY INSPECTION IN UBERLÂNDIA CITY, MINAS GERAIS STATE, BRAZIL

Beatriz da Silva Frasão¹*, Kênia de Fátima Carrijo², Marcos Dias Moreira³

¹Doutoranda em Medicina Veterinária, Faculdade de Veterinária da Universidade Federal Fluminense, Niterói, Brazil
²Doutora, Docente Faculdade de Medicina Veterinária da Universidade Federal de Uberlândia, Uberlândia, Brazil
³Mestre, Médico Veterinário autônomo, Uberlândia, Brazil. *Autor para correspondência e-mail: beatrizfrasao@id.uff.br; beatrizfrasao90@gmail.com

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ABSTRACT

Bovine tuberculosis is an infectious disease characterized by chronic, granulomatous, cheesy and necrotic process that affects especially the lungs and lymph nodes. It caused by the tubercle bacillus, known as Mycobacterium bovis, being the most common agent of bovine tuberculosis, but there is the possibility M. tuberculosis that affects almost all species. This microorganism is a causative agent of foodborne illness, with tuberculosis characterized as a zoonosis that causes losses in the production of meat and milk in several countries. Tuberculosis can be in the widely or not widespread in cattle, committing various tissues and or body or affecting only a tissue or organ, respectively. We used data provided by the Inspection Service of two slaughterhouses located in Uberlândia city, Minas Gerais state, Brazil, in order to determine and analyze the occurrence of bovine tuberculosis from January 2005 to December 2009, checking that the period in which the incidence the disease was higher, the trend over the five years. The year 2007 was most frequent (0.233%), and the prevalence in the period of five years was (0.17%). Among the slaughterhouses significant difference in the monthly occurrence, annual and total tuberculosis. The slaughterhouse under federal sanitary inspection service showed occurrences greater than the slaughterhouse under municipal sanitary inspection service.

KEYWORDS: Foodborne disease, Mycobacterium bovis, Bovine, Slaughterhouse

OCCORRÊNCIA DE TUBERCULONE EM BOVINOS ABATIDOS SOB INSPEÇÃO SANITÁRIA NO MUNICÍPIO DE UBERLÂNDIA, MINAS GERAIS, BRAZIL

RESUMO

A tuberculose bovina é uma doença infecciosa caracterizada por apresentar processo crônico, granulomatoso, caseoso e necrótico que afeta principalmente os pulmões e linfonodos. É causada pelo bacilo da tuberculose, conhecido como Mycobacterium bovis, é o agente mais comum da tuberculose bovina, porém há a
possibilidade de infecção pelo *M. tuberculosis* que acomete quase todas as espécies. Este microrganismo é um agente causador de doença alimentar, sendo a tuberculose caracterizada como uma zoonose que provoca perdas na produção de carne e leite em vários países. A tuberculose pode apresentar-se na forma generalizada ou não generalizada nos bovinos, acometendo vários tecidos e ou órgão ou acometendo apenas um tecido ou órgão, respectivamente. Foram utilizados dados fornecidos pelo Serviço de Inspeção de dois matadouros-frigoríficos localizados no município de Uberlândia, Minas Gerais, Brasil, com o objetivo de determinar e analisar a ocorrência da tuberculose bovina no período de janeiro de 2005 a dezembro de 2009, verificando qual o período em que a incidência da doença foi maior, a tendência ao longo dos cinco anos. O ano de maior ocorrência foi 2007 (0,233%), e a prevalência no período dos cinco anos foi de (0,17%). Entre os matadouros-frigoríficos ocorreu diferença significativa na ocorrência mensal, anual e total de tuberculose. O matadouro com serviço de inspeção sanitária federal apresentou ocorrências superiores ao matadouro com serviço de inspeção sanitária municipal.

**PALAVRAS-CHAVE:** Doença alimentar, *Mycobacterium bovis*, Bovino, Matadouro-Frigorífico.

**INTRODUCTION**

Tuberculosis is the single most important inflammation of the lungs, especially in cattle (SANTOS, 1979). Bovine tuberculosis is an infectious cattle disease characterized by a chronic granulomatous process cheesy necrotic that mainly affects the lungs and lymph nodes, caused by *Mycobacterium bovis* and *Mycobacterium caprae* and can also affects small ruminants, birds, humans and even other mammals (O’REILLY & DABORN, 1995; ARANAZ, 2003; SKUCE et al., 2012; DOMINGO et al., 2014). Although the majority of human infections with tuberculosis are caused by *M. tuberculosis*, some are caused by *M. bovis*, acquired by eating or drinking cattle products such as raw milk moreover, infection can occur by direct contact, as it infection is considered zoonosis becomes a public health problem (OIE, 2010; CDC, 2011; HIKO & AGGA, 2011; MAMO et al., 2011; ZERU et al., 2014).

Injuries caused by this infection may be presented localized or widespread, being found in various tissues or organs. The caseous exudative typical characteristic of tuberculosis is often not observed in infected company animals, and the lesions are shown in proliferative form (DOMINGO et al., 2014). The location and the spectrum of the lesions can be determined transmission way of bovine tuberculosis. The most common route is inhalation of contaminated particles, in this case the majority of the lesions are present in the nasopharynx and lower respiratory tract, especially in their lungs and lymph nodes (NEILL et al., 2001). However, when observed lesions in the mesenteric lymph nodes, and some or no visible lesions in the gut wall suggests that the contamination has been through the *M. bovis* ingestion, either in water or contaminated pasture ration (MENZIES & NEILL, 2000). The tonsils has also been considered a site of infection by *M. bovis*. Due to eradication programs implemented in various countries, including Brazil, the transplacental infection routes, genius or intramammary are uncommon (MENZIES et al., 2012; DOMINGO et al., 2014).
Disease onset occurs in the formation of a primary focus, which is mostly the lung occurs later in lymphatic drainage, leading to damage in the form of caseous injury to adjacent nodes, thereby forming a primary complex, difficult to heal, and progresses rapidly or slowly. If it finds form the tuber that is nothing more than a granulomatous mass, there is continuously growing granuloma increases and the sequence can undergo necrosis and subsequent mineralization, or encapsulation. There may be spread to various organs and this will vary according to the speed of development and the way it is then for the spread and can be taken two forms of tuberculosis, acute miliary tuberculosis and chronic tuberculosis (SOUZA et al., 1999; DOMINGO et al., 2014).

During the slaughter of cattle, the inspection line, it is the verification of organs, tissues and housing in search of some pathological change or not, being one of the changes sought that observed in cases of tuberculosis. Depending on the state animal before slaughter, the degree, the type and extent of the injury observed, what is done by the federal sanitary inspection service to the infected carcass during slaughter, varies and may be total condemnation of same or conditional use with heat treatment, yet all organs which have their infected ganglia should be discarded and also injured bodies, heads with injury are also condemned. Any housing to present injury, even if it is intended to conditional using can be exported (BRASIL, 2010). The sanitary inspection service is of great importance for the detection of tuberculosis (SHITTU et al., 2013), preventing contaminated food reaches the consumer's table, ensuring their health.

Being tuberculosis a disease that in addition to harming the economy, prevents exports and affects human health, the aim of this study was to analyze the occurrence of tuberculosis in bovine slaughtered under sanitary inspection in two slaughterhouses located in Uberlândia, Minas Gerais state, Brazil, in a period of five years.

**MATERIAL AND METHODS**

This research was developed in two slaughterhouses under sanitary inspection service located in Uberlândia, Minas Gerais state, Brazil, from January 2005 to December 2009. This study was based on data and information coming from slaughterhouses; by the records and maps provided by the Federal Inspection Service (FIS) and the records and maps provided by the Municipal Inspection Service (MIS). Data were collected from 216,888 cattle slaughtered in slaughterhouse with MIS and 157,440 cattle slaughtered at the slaughterhouse with FIS. The record of the number of occurrences of tuberculosis, from January 2005 to December 2009, was ordained, tabulated and analyzed.

Data were statistically analyzed using Minitab software version 16 (TRIOLA, 2008), and was applied the Kruskal Wallis test or H test, which has the same goal as the T test, but is best for non-normal data (series) which was the type of data analyzed in this work.

**RESULTS AND DISCUSSION**

**Total and Annual Occurrence of Tuberculosis**

In the 5-year period analyzed (2005-2009), in Uberlandia city the occurrence of bovine tuberculosis was in 2005 of 107 positive animals of 81208 animals
slaughtered (0.131%), in the year 2006, 149 positive of 90396 slaughtered (0.165%), in 2007, 187 positive of 80191 slaughtered (0.233%), in 2008, 139 positive of 61792 slaughtered (0.225%) and in 2009, 72 positive of 60741 slaughtered (0.119%). It is observed that from 2005 to 2007 there was an increase in tuberculosis cases, and from 2007 to 2009 cases fell. In 2009 was the year with the lowest incidence of tuberculosis and in 2007 was the year of higher incidence of tuberculosis (Figure 1).

Relating the present data with REIS & ALMEIDA (2001) found that 0.08% of the occurrence of bovine tuberculosis in the city of Uberlandia, Minas Gerais state, Brazil in 1984-1998, noted an increase of 0.095% incidence of tuberculosis in this municipality. But when compared with research by GUIMARÃES (2003), with tuberculosis occurrence in Uberlandia, Minas Gerais state, Brazil, from 1984 to 2001 of 0.21%, we can notice a drop of 0.035% incidence of tuberculosis when compared with this study had occurrence of tuberculosis 0.175%, in Uberlândia, Minas Gerais state, Brazil in 2005-2009. The difference can be attributed due to climate variables, cattle density and a change in the range of host and breeds (HUANG et al., 2013).

Still, bovine tuberculosis may vary among the flocks, and some herds have various periods of infection and other peaks keeps free of infection. Furthermore, the occurrence of bovine tuberculosis are not uniform, can occur sporadically, permanent or recurrent form (SKUCE et al., 2012). It can also be influenced due to introduction of infected animals in the herd, which is considered one of the main forms of tuberculosis introduction in it (WHELAN et al., 2010).

The tuberculosis prevalence in other countries is much higher than that found in this study, ranging from 12 to 65%, Mozambique, Uganda, Govuro (INANGOLET et al., 2008; MOIANE et al., 2014). This fact can be explained by the climate difference, the implementation of control and tuberculosis eradication programs in Brazil, way of raising animals in other countries because as it is a disease whose main route of transmission of the particular inhalation being so the density of the herd can influence

**Total and Annual Occurrence of Tuberculosis in each Slaughterhouse**

During the five years analyzed (2005-2009), was observed 220 (0.101%) animals positive for tuberculosis within 216,888 animals slaughtered in the municipal slaughterhouse, and 434 (0.276%) animals positive for tuberculosis within 157440 animals slaughtered under federal inspection service slaughterhouse. It appears then that the slaughterhouse with Federal Inspection Service has more occurrence of bovine tuberculosis than in the slaughterhouse with Municipal Inspection Service, although a few cases in the two slaughterhouses.

At the slaughterhouse with Federal Inspection Service he prevalence of tuberculosis was 0.186% in 2005; 0.182% in 2006; 0.439% in 2007; 0.354% in 2008; and 0.227% in 2009. At the slaughterhouse with Municipal Inspection obtained a prevalence of 0.092% in 2005; 0.151% in 2006; 0.068% in 2007; 0.133% in 2008; and 0.057% in 2009 (Figure 1). According to statistical analysis and the H test performed comparing the data of the two slaughterhouses, found that H = 6.82; DF = 1; P = 0.009; where P <0.05 there is a significant difference between the occurrence of tuberculosis per year between the two slaughterhouses.

The difference between the two slaughterhouses at the same time, can be attributed to the fact that the origin of the animals despite being nearby regions, are not always the same region, also the presence or absence of sources as infected
wild animals can also interfere (WHITE et al., 2013). Furthermore bovine tuberculosis may vary among the flocks, and the occurrence of bovine tuberculosis, is sporadically, permanent or recurrent, not presenting a uniform behavior (SKUCE et al., 2012). Still, the greatest prevalence found in the slaughterhouse with federal inspection can be attributed to a greater number of trained agents, with closer inspection, then detecting smaller and injuries. And also because the number of animals slaughtered in the slaughterhouse with federal inspection be less than the number of animals slaughtered at that with municipal inspection, for probably the inspection line had lower speed that he brought down fewer animals, while allowing a more detailed inspection.

FIGURE 1 Annual Occurrence of Bovine Tuberculosis in slaughterhouse with Federal Inspection Service (FIS), slaughterhouse with Municipal Inspection Service (MIS), and total of the two (TOTAL), in a period from January 2005 to December 2009, in Uberlandia City, Minas Gerais State, Brazil.

The year with the highest occurrence in the municipal slaughterhouse was 2006 with 0.151% prevalence of tuberculosis and the lowest was 2009 with 0.057%; in the federal slaughterhouse the year with high prevalence of bovine tuberculosis was 2007 with 0.439% and the lowest was 2006 with 0.182% of tuberculosis cases. The same year, mostly occurring at the municipal slaughterhouse was the lowest occurrence in federal slaughterhouse, 2006 (Figure 1). These years had a higher occurrence may be due to the presence of foci of infection for cattle slaughtered at this time, or by varying the slaughtered herd.
Monthly occurrence of Tuberculosis

The occurrence in every month of every year in the slaughterhouse with Municipal Inspection and with Federal Inspection were compared and obtained the results shown in the Figure 2, with the total occurrence percentage. The $H$ test observed $H = 17.29$ and $P = 0.00$; where $p<0.05$ has significant difference in incidence of tuberculosis comparing each month between slaughterhouses.

The federal slaughterhouse had important peaks of prevalence of tuberculosis in March 2005 (0.830%), June 2007 (1.157%), March 2008 (1.082%) and June 2009 (1.538%) the latter being the highest peak. The municipal slaughterhouse had an important peak in July 2008 (0.520%), other months remained low occurrence, and until this peak that stood out from the other months in the slaughterhouse with Municipal Inspection is lower than the peaks observed at the slaughterhouse with Federal Inspection. In 2007 and 2009, the month of June was the month of highest incidence observed in the federal slaughterhouse. At the municipal slaughterhouse, July 2008 was the month with higher numbers. These peaks can be explained by the fact that a wide range of livestock slaughtered in each slaughterhouse, with the ability to focus on property (WHITE et al., 2013) that had slaughtered those months specifically. In addition, tuberculosis is a respiratory disease it may be more common in the colder seasons as autumn and winter, months up presented then within two seasons and can also be a justification for the presence of peaks. One of the main form of introduction of tuberculosis in cattle is the acquisition of animals infected with
the causative agent (PÉREZ-LAGO et al., 2014), one justification to the peaks observed the acquisition of new infected animals in herds led to the slaughter.

Further research will be carried out so that we can determine the real factors the event of high tuberculosis in some periods of the year, and the occurrence of difference between slaughterhouse with federal inspection and one with municipal inspection.

CONCLUSION

The occurrence of tuberculosis in the slaughterhouse with municipal inspection and slaughterhouse with federal inspection as well as the municipality of Uberlandia, have low levels. And as an occasional or recurrent, without a uniform behavior during each year and also within each year.

A lower speed on the slaughter line may favor a more detailed inspection, allowing more reliable detection Tuberculosis.

REFERENCES


