

Available Online at EScience Press
Journal of Zoo Biology
ISSN: 2706-9761 (Online), 2706-9753 (Print)
<https://esciencepress.net/journals/JZB>

SOME ASPECTS ABOUT THE BOVINE TUBERCULOSIS

Ebrahim B. Ahmady

Veterinary Faculty, University of Ilam, Ilam, Iran.

**Corresponding Author Email: ebrahim_12@yahoo.com*

ABSTRACT

Tuberculosis is a contagious infectious disease, which is produced by different species of bacilli of the genus *Mycobacterium*. It has been characterized by the presence in different species of animals, including very important, its impact on the man who, in the same time he has chronic and has been affected in different organs or systems of species. The lesion has classically described the formation of tuber in different sizes; in general, the most affected organ is the respiratory apparatus and particularly the lungs. The existence of the disease is global and its impact on social and economic life is extremely important. Tuberculosis has taken its toll on most of the animals and humans.

Keywords: Disease, Contagious Infectious, Bacilli, *Mycobacterium*, Species, Tubers.

INTRODUCTION

Bovine tuberculosis is an infectious contagious chronic disease caused by bacteria of the genus *Mycobacterium* that keeps a close relationship with the bacteria causing the human and avian tuberculosis. It is one of the most important diseases of cattle, both by its impact on public health such as its economic impact on a country. Its incidence limits the development of animal husbandry and its associated products, including exports. However, the pathogen is present in animals in developing countries where there are no appropriate control measures. The name of "tuberculosis" comes from the nodules, called "tubers", which are formed in the lymph nodes in the affected animal. It is an important zoonosis (can be transmitted to the human being) and it is a notifiable disease.

HISTORY

Tuberculosis without a doubt is known as one of the oldest diseases. It has been argued that since the fourth century BC, this disease was endured by the men. Tisis, the pearl of the animals, was considered in the sixteenth century as a form of syphilis but something later, it is posed that tuberculosis in cattle and the disease of man, was due to the same origin. In 1882, Robert Koch demonstrated the presence of germ causing tuberculosis, and the causal relationship above noted. In 1890 Robert Koch the man of science, released a product called

tuberculin, which had a foundation, using it in the treatment of the disease, an error which subsequently was corrected. For the year 1901, it was argued that although there was a causal relationship, the source in its essence was different in respect of presence the disease in humans and cattle. Subsequently, it was possible to know with certainty that the causes were specific to each species.

SYNONYMS

In the man, the disease has been known with its employment more or less current with various names, namely: Tisis, Tisis pearly, pulmonary Tisis, nodal disease or simply tuberculosis as a term more generalized to different countries and languages.

GEOGRAPHICAL DISTRIBUTION

Speaking of distribution, both in the generic form, as well as by animals species affected, in spite of the efforts of the various countries and territories, we still can say today that the disease is cosmopolitan, even it is included in this criterion some countries that have declared themselves free of the disease, in fact, that has occurred in various countries in Europe. In the world although there is an affectation of nature spread but resources used in different parts of the world have allowed the prevalence and incidence, as well as the corresponding focality have fallen significantly, so it is likely in a very short time to declare large territories is rich and free of the disease in the world.

ECONOMIC IMPORTANCE

As a result of this disease, losses occur by total and partial seizures of meat at the slaughterhouses. According to Allenspach, performed calculations in 1963, according to

as decreases the percentage of tuberculosis, the average weight of animals slaughtered has increased; for example, provide the data in table 1.

Tabla # 1. Pérdidas por decomiso total y parcial de carne en los mataderos, reportado por Allenspach en 1963.

Year	% of the Tuberculosis	average weight control
1952	40-50	268
1859	8-9	299

Since then should be considered the referred increase from other improvements in the system of tenure. It has been estimated that the sick cows of tuberculosis, have a decrease in 10 - 25 % of its normal production of milk. It has also been pointed out that there is a short life of the animal between 10 - 20 %. In Switzerland, it has been found that the average age of animal's slaughter has been risen by eliminating or reducing tuberculosis. In the same way, noted that the animals have decreased in their work performance and when the disease occurs in their genital apparatus is the cause of sterility. In those herds where the disease is presented, there is necessary to improve veterinary assistance, as well as disorders, occur in the purchase - sale of animals because they produce claims, returns, litigation, etc. In the livestock, trade is considered that the value of a tuberculous animal is reduced to 50-60 %.

SOCIAL IMPORTANCE

As already mentioned, tuberculosis is a very ancient disease in human beings and even in our days, despite progress in its control, it is given the category, as one of the most dreaded by the man. It is considered by many countries that approximately 10 % of human tuberculosis is caused by the bovine bacillus. Therefore, it is necessary to consider that the bovine tuberculosis is responsible for the tenth part of the costs related to the fight against tuberculosis. At the same time, it must be taken into account the losses in salaries, expenses for treatment, etc.

POLITICAL IMPORTANCE

In dependence of the political system in each country, it will be the conception of the importance of the disease, in humans and animals. In some countries of the world, the attention or concern regarding to disease, is given by minority interest and by sectarian assumptions that respond only to large landowners (basically) to the detriment of the country affectations; That is to say the attitude or the activities to follow, respond only to the

concerns of profits for farmers who dominate this sector of production and they are protected by the state and other institutions of the regime. In other countries of the world, the livestock policy responds to the national interests, which are not subject to private owners and where the livestock will swell the public treasury, for more equitable distribution in society. Needless to say, this represents in relation to the presence of the disease in humans in relation to the social system. In some countries due to lack of resources, the state does not have huge resources to care for the population, and for the vast majority of those affected, usually a few or no income, it is impossible to undergo lengthy and costly treatment. However, in the countries of real medical insurance, precisely for this disease have the greatest care, tuberculosis being one of the diseases which are intended for large budgets, in particular, for better and more rapid recovery.

ETIOLOGY

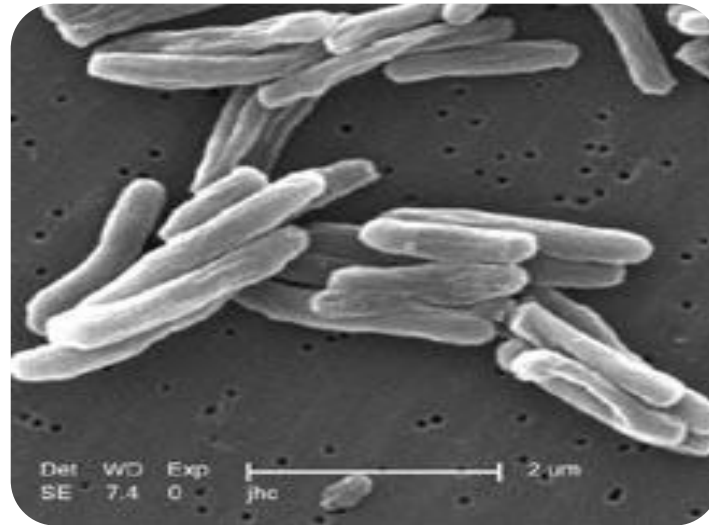
Morphology: The morphology of the Mycobacterium tuberculosis is a thin bacillus of 0.2 - 0.6 micron in diameter by 1.5 to 4 in lengths, although there are variations according to the different species, (Figures, 1).

Cultivation: In cultivation it has been observed that the tubercle bacilli need aerobic conditions for culture in vitro, the optimum temperature is 37°C, although it can grow more slowly to other temperatures. The optimum pH is variable depending on the species of mycobacteria, it is estimated to bovine from 5.8 to 6.9. The avian strains require average alkalinity. The tubercle bacilli can be grown in artificial environments, but they often do not find alone, so it is necessary to add other products to facilitate the growth of mycobacteria that can be grown on solid media, although the growth of different species of germs shows their particularities. The liquid media are also used but with similar characteristics.

In order to distinguish between different mycobacterial species as well to perform drug susceptibility and identification tests, culture examination becomes a

necessity. The culture of sputum provides a definitive diagnosis of tuberculosis by establishing the viability and identity of organisms. However, compared to other bacteria, which typically reproduce within minutes, *M. tuberculosis* proliferates extremely slowly (generation time 18-24 hours).

Furthermore, growth requirements are such that it will not grow on primary isolation on simple chemically defined media. The only media that allow abundant growth of *M. tuberculosis* are egg-enriched media with glycerol and asparagine or agar-based media supplemented with bovine albumin.



Figures, 1. The morphology of the *Mycobacterium tuberculosis*.

Resistance: In the case of the resistance, it is well known that the presence of a lipid substance increases the resistance to harmful agents. The bacilli in exudates dried content may be viable for months, the direct sunlight inactive or destroys the mycobacteria in few minutes: The tuberculosis germs are very sensitive to high temperatures; the cresolicos compounds to 2 - 3 % are effective; alcohol is effective (70 - 95) between 15 - 30 of exposure.

Immunogenicity: Regarding the immunogenicity, it is well known that many species and animals have a natural resistance to tuberculosis. From studies, carried out by Koch was learned that the active infection can cause a degree of immunity in the guinea pig from a second inoculation and that the germ or their products hypersensitive the infected animal. However, the

progressive nature of tuberculosis in animals and humans indicates that the infection does not produce the same degree of immunity that is observed in other diseases. Since Koch published his findings, he has tried to make a preparation to immunize against tuberculosis. One of the most known and used products is the BCG vaccine that consists of live attenuated bovine germs by hundreds of media passes and crops of potatoes and ox bile, which in countries that used is capable (harmless) in calves and kids.

Pathogenicity: In relation to the Pathogenicity, the three types of tubercle bacilli are characterized by their action on their respective pathogenic primary hosts, although each type is capable of producing disease in other animal species (Table # 2).

Table 2. Relative virulence for animal's laboratory of the main types *Mycobacterium tuberculosis* in warm-blooded animals.

<i>Mycobacteria</i>	<i>Species</i>		
	<i>Cobayo</i>	<i>Rabbit</i>	<i>Hen</i>
<i>Human</i>	+	±	0
<i>Bovine</i>	+	+	0
<i>Avian</i>	±	+	+

Legend: + = Receptive - = Slightly receptive 0 = Highly resistant

The tuberculosis germs are divided into two large groups: pathogenic mycobacteria and Mycobacteria saprophytes. In the first group are considered the following examples:

- Of the fish and other cold-blooded animals: *Heleobia piscium*, freshwater fish; *M. anabanti*, exotic fish of the family anabantida; *M. marinum*, salt-water fish; *M. ohelonei*, tuberculosis of the tortoise; *M. ranae*, frog; *M. thamnopheos*, tuberculosis of the Culebra; *M. tropidonatum*, tuberculosis of the snake.
- Of the Birds: *M. avium*; tuberculosis of the birds.
- In rodents: *M. tuberculosis* var. *Muris*, the vole tuberculosis; *M. muxis* isolated in the mouse intestinal contents; *M. lepraemurium*, a disease of the rat presented skin lesions.
- Pig: *M. ovisluteum*, of lymph pork.
- The man: *M. tuberculosis* var. *Hominis*, tuberculosis of man; *M. tuberculosis* var. *Skin*, skin lesions; *M. leprae* tuberculosis, leprosy producing agent; *M. kansasii*, *M. avium* and *M. aquae*, they also have significant pathogenic for humans.
- From Bovine: *M. tuberculosis* var. *bcg*; *M. paratuberculosis*, paratuberculosis agents; *M. skin lesion* producing nodular dermatitis; *M. queilitis aquae* in the cow.

In the second group, the following examples are considered: *M. butyricum*, butter bacillus isolated in 1957; Moeller *M. Hay* isolated in 1898 in the alfalfa; *M. phlei* and *M. phlei* I II, isolated in 1899 powder used in forage grass; Mist and *M. aterculosis* Bacillus isolated in 1901 manure and feces of cows and other herbivores; *M. smegmatis* of smegma, first described in 1885 in varying amounts in the smegma.

SUSCEPTIBLE SPECIES

The susceptible animal species are very different to tuberculosis. A more general concept can be given, to consider which warm-blooded animals and various species of cold blood, the suffering of the disease, although in varying degrees for some and others, a reference that can be taken from the table 2.

EPIDEMIOLOGY

Bovine tuberculosis is an infectious-contagious disease caused by *Mycobacterium bovis*, which is a member of the *Mycobacterium tuberculosis* complex. It is affecting to cattle, producing a chronic box, which generates economic losses by the death of animals, seizures at the level of slaughterhouses, lower productivity and valuation of milk. It can affect domestic and wild animals.

It also has a zoonotic nature, for what acquires great importance to public health. It is characterized by the development of granulomatous lesions from 1 to 2 cm in diameter or tubers that can form nodules through the growth and coalescence of one or several of them. *M. bovis* is a microorganism bacillus acid alcohol resistant, strictly aerobic and slow growth in culture media.

SOURCES OF INFECTION

The sources of infection of primary importance are sick animals, they have the manifests of disease or not; therefore, all their excretions and secretions are taken very much into account. The territories and premises occupied by the sick animals have equal significance, including the atmosphere, because germs can maintain and transmit by this way.

TRANSMISSION ROUTES

The agents of tuberculosis are transmitted by two fundamental ways, namely; the aerogen and enterogen. In the first by the known mechanisms of air - dust and air - drop. In the second by the oral route through contaminated food and water. In addition to these forms: by copula genital when there is genital tuberculosis; galactogen, when the bacilli penetrate through the nipple; by skin wounds that generally produce local tuberculosis in the entrance route; sometimes by the castration that is seen in both cattle and pigs. The umbilical pathway cannot be excluded. The transmission through the intrauterine track has been demonstrated. In general, do not exclude any possibility, have been noted at least the most frequent forms, (Figure 2).

PATHOGENESIS

Taking into account the transmission routes of cases referred to earlier and therefore the point of penetration or entrance route can be described in most general aspects of the phenomenon that we are dealing with. At the point where the tubercle bacilli are fixed, an inflammation manifests, in part, occurs by proliferation and also for exudative processes. The tuber that is formed, initially it is microscopic, by grouping around the bacilli, epithelioid cells and followed by a dense ring of lymphoid cells that contains the existing cellular group; at the same time penetrates the cells an exudate, which coagulates and originates a fibrin network. The tuber exempts of vessels, necrosed from clotting, and for that reason, the intercellular exudate is transformed into a caseous mass. In the caseous tubercle can be deposited salts of lime or occur healing to heal. When the tuberculosis bacilli penetrate in a body, seated in the

entrance route or in their vicinity, producing a specific inflammation, which is accompanied by a similar condition of the regional lymph nodes, a phenomenon known as "complex primary". However, the process can only occur in the lymph nodes then the phenomenon called "incomplete primary complex". The primary complex is generally found in the man, dog and adult cattle in the lungs; mostly in the calves in the digestive system, something similar happens to the pigs. The primary complex can remain and even cure by limiting or

fibrous transformation. If the organic defences are not sufficient, the infectious process invades other organs by the linfohematogena track. The chronic tuberculosis of the organ is usually invading adjacent by growth and performed by the channels (bronchi, lactiferous ducts). The only domestic animals are presenting chronic tuberculosis, are adults' cattle; the calves and in general in young animals, pigs in the short-lived, in horses and in the carnivores, takes in the form of complex primary that cure or is followed by generalization.

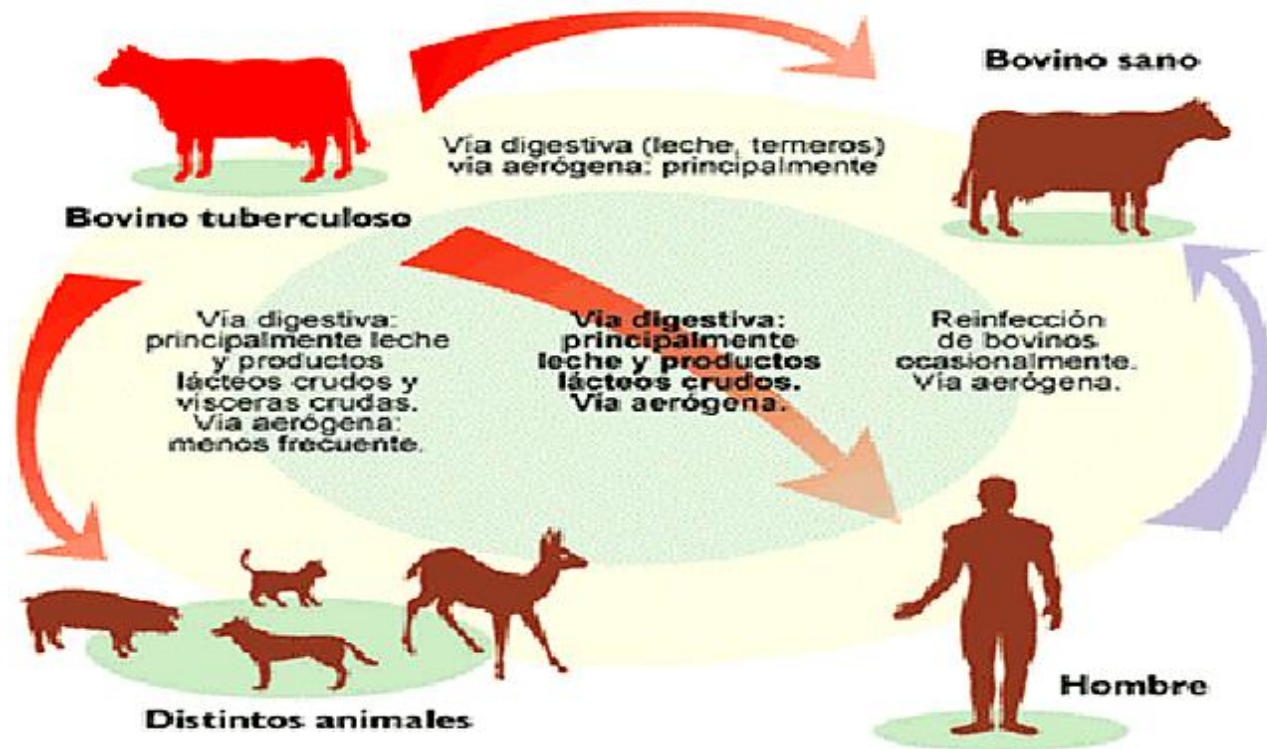


Figure 2. Transmission Routes.

PATHOGENESIS

Taking into account the transmission routes of cases referred to earlier and therefore the point of penetration or entrance route can be described in most general aspects of the phenomenon that we are dealing with. At the point where the tubercle bacilli are fixed, an inflammation manifests, in part, occurs by proliferation and also for exudative processes. The tuber that is formed, initially it is microscopic, by grouping around the bacilli, epithelioid cells and followed by a dense ring of lymphoid cells that contains the existing cellular group; at the same time penetrates the cells an exudate, which coagulates and originates a fibrin network. The tuber

exempts of vessels, necrosed from clotting, and for that reason, the intercellular exudate is transformed into a caseous mass. In the caseous tubercle can be deposited salts of lime or occur healing to heal. When the tuberculosis bacilli penetrate in a body, seated in the entrance route or in their vicinity, producing a specific inflammation, which is accompanied by a similar condition of the regional lymph nodes, a phenomenon known as "complex primary". However, the process can only occur in the lymph nodes then the phenomenon called "incomplete primary complex". The primary complex is generally found in the man, dog and adult cattle in the lungs; mostly in the calves in the digestive

system, something similar happens to the pigs. The primary complex can remain and even cure by limiting or fibrous transformation. If the organic defences are not sufficient, the infectious process invades other organs by the linfohematogena track. The chronic tuberculosis of the organ is usually invading adjacent by growth and performed by the channels (bronchi, lactiferous ducts). The only domestic animals are presenting chronic tuberculosis, are adults' cattle; the calves and in general in young animals, pigs in the short-lived, in horses and in the carnivores, takes in the form of complex primary that cure or is followed by generalization.

IMMUNE RESPONSE TO MYCOBACTERIUM TUBERCULOSIS

The alveolar macrophages, after entry of *M. tuberculosis*, produce inflammatory cytokines and chemokines that serve as a signal for infection. The monocytes, neutrophils, and lymphocytes migrate to the focal site of infection, but they are unable to kill the bacteria efficiently. During this time, the bacilli resist the bactericidal mechanisms of the macrophage

(phagolysosome) by preventing phagosome-lysosome fusion, multiply in the phagosome, and cause macrophage necrosis. The released bacilli multiply extracellularly, are phagocytosed by another macrophage that also fails to control the growth of *M. tuberculosis*, and likewise, are destroyed. In the meantime, dendritic cells with engulfed bacilli mature, migrate to the regional lymph node, and prime T cells (both CD4⁺ and CD8⁺) against mycobacterial antigens. The specific immune response produces primed T cells which migrate back to the focus of infection, guided by the chemokines produced by the infected cells. The accumulation of macrophages, T cells, and other host cells (dendritic cells, fibroblasts, endothelial cells, and stromal cells) leads to the formation of a granuloma at the site of infection.

SYMPTOMS OF THE SPECIES

In cattle, the most frequent form is the disease of the respiratory tract (lungs) that is manifested by the presence of a brief cough, dry and strong, in the early days. The lack of appetite will appear and makes a remarkable progressive state of tiredness, (Figure 3).

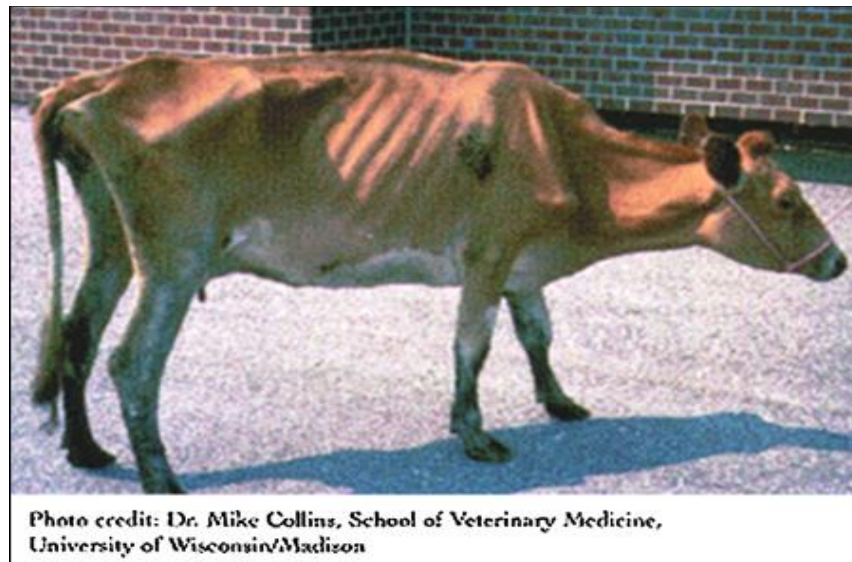


Figure 3. A state of progressive fatigue.

It makes present the expulsion of a secretion mucopurulent that most of the time it is swallowed. The breathing becomes rapid and difficult; auscultation hears thumps. In correspondence with the diagnosis, the alteration of concomitant pre-scapular lymph nodes is very important. There may be alterations of the nasal mucosa and lymph nodes in the outer channel, which in the latter is increasing in volume. The tuberculosis of the

pleura is able to recognize, for the increase in the sensitivity of the chest or by the action of the percussion; a pleural friction rub can be determined by auscultation. With the progress of the disease, there are pale mucous membranes (anaemia) and have seen increase wasting. The weakening of the animal is contributing to an increase in diarrhoea. The presence of periodic bloating was due to the pressure exerted by the lymph nodes that

compress the thoracic oesophagus disorders that bring in the cud. At the end the animals are standing, with the elbows to port of the chest, head down and the tongue out; the breathing is wheezing and whining, the cough is painful and by the nose flows a purulent secretion; finally, the animals cannot remain unemployed and they throw, with persistent diarrhoea and after a prolonged agony, they die. The tuberculous pericarditis, tuberculosis of the genital organs and the abdominal organs, the udder, the urinary tract, or the central nervous system, etc., are described in special works, known classically. In pigs, the disease manifests itself in preference of the lymph nodes that are tuberculous mass, hard, stick to the surrounding area; the unison develops a diffuse swelling of the outer channel of the region or sub - a handset that dislocates the movements of the head and lower jaw. The impact of abdominal is manifested by digestive disorders, and nutrition. The anorexia is increasingly accentuated; constipation alters with diarrhoea. The liver disease can be recognized by an increase in volume to palpation. Animals become wasted, anaemic and succumb after some months. In the equine, starts suspecting the disease by the progressive loss of weight, even when the appetite is preserved and produce light thermal elevations. Tuberculosis of the intestine and mesenteric lymph node, manifested by the few symptoms characteristic of such disorders as: poor nutrition, developmental delay, cramps, irregular bowel movements, etc. In the goat, the pulmonary tuberculosis is observed with emaciation, moist cough or hoarse, painful cough, shortness of breath, and there is the presence of flatulence and diarrhoea. The temperature is normal, although sometimes the febrile syndrome is appreciable. Tuberculosis of the udder is seen as a painless, hard tumor and tuberos. In the ovine disease, when it occurs is often similar.

PATHOLOGICAL LESIONS

In cattle, as a type species for review, can say the primary complex appears in the lung, presenting a conglomerate of tubers, calcified to form a tuberosity sub-plural, (Figure 4). They have formed the alterations in the early course of generalization; they can find numerous typical tubers of variable size, well-circumscribed, often forming a calcified tubercle. Regional lymph nodes always offers alterations. In advanced cases the hotbeds originate anfractuous voids (caves) that contain purulent mass caseo-resistant and whose thick wall is smooth or upholstered with purulent granulation tissue distribution.

DIAGNOSIS

The clinical diagnosis, pathomorphology and microbiological can be carried out by taking into account the references to each of these aspects in previous sections, where you can find a greater amount of data through the consultation of special works. The serologic diagnosis, although it is possible to use, in the practical order is not recommended. It is of interest to the complement fixation test, which can be used both with blood serum as with serum of milk. More recently, researchers have published interesting results in relation to the serology of tuberculosis, but at present are kept with mere investigative achievements. The biological diagnosis is to test the hypothesis by inoculating epizootic of suspect material to experimental animals, which in cases positive allows an isolation and correct classification of the germ officiating, also the achieving macro and microscopic description of the injury and in case of possible recognition of the clinical course, including the testing of any treatment. The allergy diagnosis, originated with the discoveries of Koch, although that was not its purpose, as he has already been said. This scientific achievement of great value in the practice, particularly in the diagnosis of tuberculosis in cattle; has allowed us to develop an intense and fruitful work in the fight against this terrible disease.

For performing this test, it requires a preparation that has been called tuberculin (allergen) that can be grouped into the following groups:

- Old tuberculin of Koch: is known as TA in the German literature; OT in the Anglo-Saxon and UT in Latin. It is obtained by cultivation of germs in the glycerinated broth which at 6 - 8 weeks are sterilized to heat; it is filtered and evaporates up to reduce its volume to one-tenth. It is obtained impure crude tuberculin aspect that allows its subsequent and final preparation. The disadvantages would be pointed out, having a content of active elements very variables; the method of preparation cannot be controlled to produce a tuberculin of the same value in successive batches. The foreign presence of protein substance to the bacillus of tuberculosis from the culture medium and in addition to vapour that emits during its preparation is dangerous to the preparer.
- Synthetic Tuberculin: this is the name given the tuberculin to derived from synthetic means for the cultivation of the germ in which is used as nitrogen

source asparagine and this can avoid the meat broth used in the OT, which gives origin to the foreign proteins to the bacilli. When the medium used for cultivation is the Dorset, the tuberculin is identified as S. M. C. H. (Synthetic medium concentrated by heat); If they use the synthetic medium, the tuberculin is called S and L if the medium used is long. This is similar to the tuberculin of Koch; contains all the products of the metabolism of growth of the tubercle bacilli, varying amounts of polysaccharides, nucleic acid, glycerin and protein active principles. If the concentration of tuberculin is an open container, there is a loss of up to 50% protein.

- Tuberculin PPD purified type: The abbreviation PPD Sibert was applied in 1932 to designate a "purified protein derivative", prepared from concentrated bacterial filtration and steamed in a synthetic medium. The term PPD must be applied to any tuberculin in which the protein has been separated from other substances; this does not imply absolute purity.

The main advantage of the PPD is that all lots are prepared with the same amount of tuber - protein and using the same strains, cultivation and technical in its preparation; therefore, the activity of the different lots should be similar.

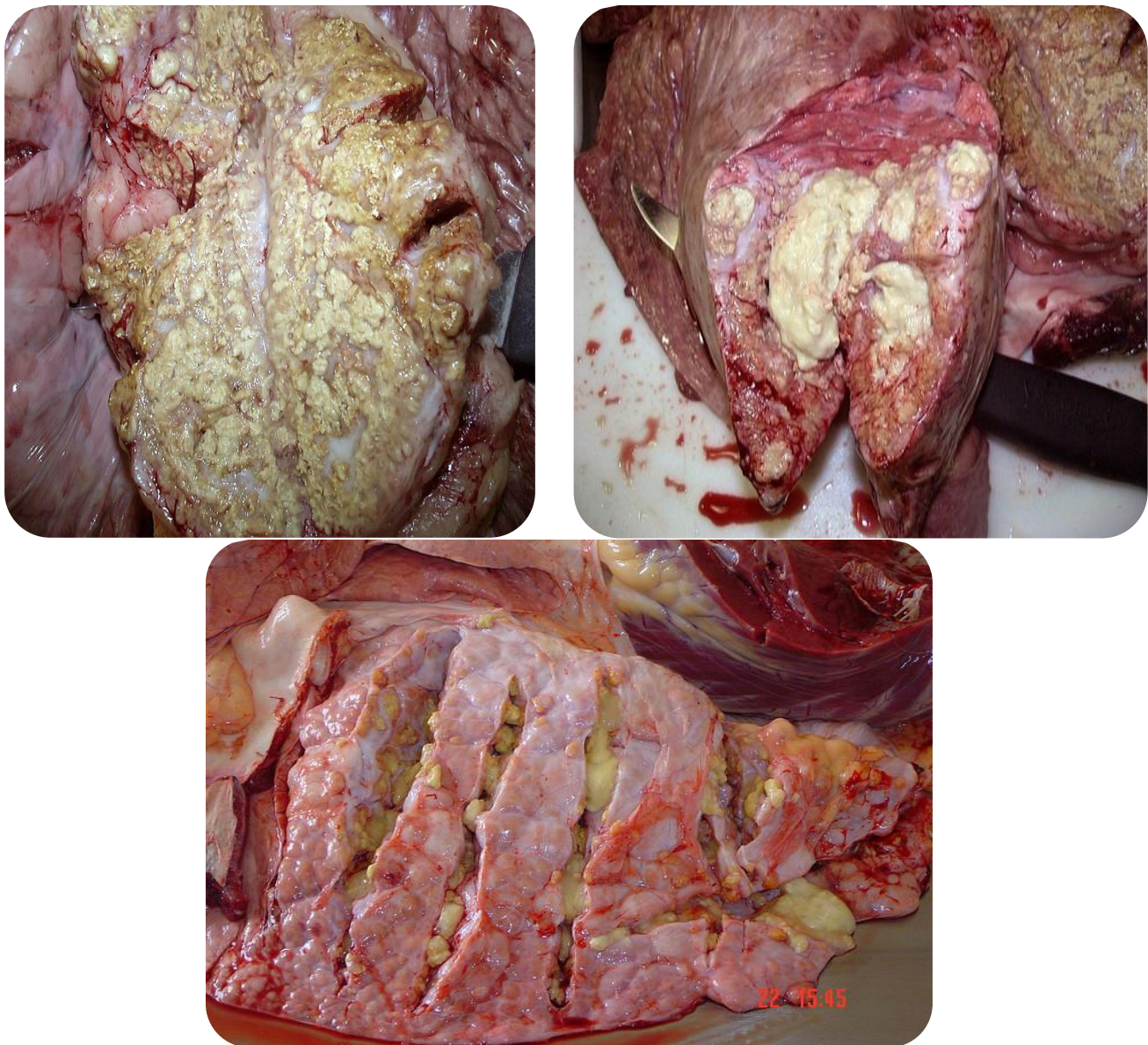


Figure 4. Tuberosity of sub-plural.

In the preparation the cultures of tuberculin are used cultures the mammalian tubercle bacilli (M) and birds (A). Type human strains most commonly used, are: PN, DT and C of animal industry bureau. The bovine type most commonly used, is the NA-5 Weybridge; for avian type strain D- 4 is used.

There are countries that have been using (M) S - 2 and the AN for the tuberculin of human origin (H) the E and the 9656. Techniques for the application of the tuberculin skin test have been very varied, so we have: The test subcutaneous tuberculin, the ocular, the intra-dermo-palpebral and the tuberculin skin test with their varieties in terms of place of choice for its realization. Of the above, including their variants are currently used by the PDP in the table of the neck that consists in the inoculation of 0.2 ml intradermal and at 72 h was taken to the corresponding reading past it in a table of interpretation which takes into account the epizootic situation of each place.

To make the most appropriate interpretation must be taken into account the following matters:

- Infections by Mycobacterial - non-specific bacteria
Are common and have been called para-allergic. In addition to the bacilli of bovine tuberculosis and human, there is a vast world of mycobacteria, germs all has been - resistant alcohol, some pathogens, other to be showing some pathogenicity and some others, that by the time did not seem. These germs have been named mycobacteria atypical unclassified or anonymous.

In 1959, Runyon proposed to distinguish 4 groups of different mycobacteria of *N. tuberculosis* and *M. bovis* depending on the speed of growth and the conditions of appearance of pigmentation.

The group I includes the photo- color-formers mycobacteria that produce a pigment yellow-orange of short exposure to light (one hour), followed by a stay of 24 h in the darkness of the stove. Grow at 25 °C. Slowly and faster than the tubercle bacilli at 37 °C. Are generally isolated in patients with tubercles processes.

The group II or Scotochromogens, whose colonies are always yellow-orange, both in darkness and in the light. They grow from 20 to 25 °C and also at 37 °C. But slower than the tubercle bacillus.

The group III includes the bacilli not a photo-chromogen, nothing or very little pigment.

The group IV they understand the fast-growing

bacteria (one, two days, even in ordinary means), little or no pigment, with bulky colonies, wet, rough or smooth colonies.

- For other infections or hormonal influences (nonspecific).

They are produced to the consequences of other diseases (brucellosis, actinomycosis, etc.), or by hormonal influences, advanced pregnancies, births, etc. Among these causes of error there are some who do not seem to agree. The recent childbirth, for some it is desensitizing and for others the opposite.

- By Injury and irritation at the site of inoculation (pseudo allergic)

They cite, among them the diseases of the skin (scabies, Tina, hypodermosis, and lesions, bruises and irritations in the inoculation point.

It should be taken into account that the reactions para - allergic become more obvious when the campaigns are in the more advanced stages and the percentages of tuberculosis is very low. When they appear, can be used for their differentiation to the simultaneous employment of tuberculin M and A. The two injections can be placed simultaneously in the same table of the neck, about 12 cm of distance or one on each side. For the interpretation, there are also tables that allow an opinion in every situation. The three previously mentioned aspects are grouped together in what are called false positive reactions.

Within which includes false negative reactions, we have the following:

- Severe cases of bovine tuberculosis (early widespread, chronic tuberculosis, forms depletion, etc.).
- Lack of energy, because of other diseases that compromise the nutritional status and general conditions (cachexia, parasitosis, severe anaemia, puerperal diseases, the final state of disease by foreign bodies, kidney disorders, hepatitis, pulmonary, malnutrition due to lack of food, etc.
- Because the animal found in pre-allergic Phase.
- Exhaustion, Fatigue, the transport, etc.
- Some cows recently calved, energy or hypoergia post-partum.
- Cases of sensitization by repeated tests of the tuberculin.

For differential diagnosis should consider exudative bovine pleuropneumonia, verminous pneumonia,

actinomycosis in the same species, echinococcosis, traumatic pericarditis, leukaemia and pseudo-leukaemia; glanders in horses and chronic goiter; ricketts, especially in young pigs and others perhaps less frequent.

ACCORDING TO THEIR UTILITY APPLICATION

In the application according to their utility by generalizing in regard to the different diagnostic methods, they are all possible employment and relative utility. However, they must abound in the specific sense of what it refers to the clinical and allergy diagnosis. As regards the first, it is known that at the present time tuberculosis, does not correspond to the classical description that it has been done historically, because of the existence of the plans to fight with quite a precocity that enable you to discover the sick animals, although presumably not use shelters. As for the second, up to the present, there is no doubt that the method of greater practical utility by its mass use, easy implementation and quick response, without intending to hide their complexities, in addition, the high power or power of detectability with that every day brings the tuberculin and allows to deposit a high confidence in him.

EPIZOOTIC DIAGNOSIS

The epizootic diagnosis is formed from the anamnesis epizootic, the reference test (allergic) and the results of the methods, which plays a big role the existence of atypical mycobacterial bacteria, where heavily you should use the microbiological diagnosis and its characterization.

ANTI-EPIZOOTIC MEASURES PREVENTIVE AND RECUPERATIVE

Anti- epizootic measures preventive and recuperative to obey a tuberculosis control plan aimed at the detection of the reactors by the reference test or basic (allergic) and subsequent sacrifice. Of course, in the campaign the other methods are not obviated.

An effective plan of struggle is based on three fundamental aspects that are:

- Protection of human
- Protection to herds and not affected territories
- Recovery of herds and affected territories

Considering the specific characteristics of the micro-bacteria and the disease they produce, the measures to take are in consequences with them. All the detailed aspects may be revised in the plan of struggle against tuberculosis.

CONCLUSIONS

At present, the incidence of tuberculosis has grown, in

part due to *Mycobacterium bovis* often infects animals. Tuberculosis threatens to become an incurable disease by the poor administration of programs against this. The animals are not vaccinated because existing vaccines have variable efficacy and interfere with testing to eradicate the disease. In humans, vaccination is practiced.

REFERENCES

- Chen, M., Gan, H., Remold, H.G., 2006. A Mechanism of Virulence: Virulent *Mycobacterium tuberculosis* Strain H37Rv, but Not Attenuated H37Ra, Causes Significant Mitochondrial Inner Membrane Disruption in Macrophages Leading to Necrosis. *The Journal of Immunology* 176, 3707-3716.
- Gonzalez-Juarrero, M., Turner, O.C., Turner, J., Marietta, P., Brooks, J.V., Orme, I.M., 2001. Temporal and Spatial Arrangement of Lymphocytes within Lung Granulomas Induced by Aerosol Infection with *Mycobacterium tuberculosis*. *Infection and Immunity* 69, 1722-1728.
- Loos Scarth, L., 2006. *The Merck Veterinary Manual Online* (8th edition), Whitehouse Station, NJ: Merck and Co. Reference Reviews 20, 40-40.
- McAdam, K.P.W.J., 1995. Book Review: *Clinical Tuberculosis* Edited by P.D.O. Davies. 426 pp., illustrated. New York, Chapman & Hall, 1994. \$99.95. 0-412-48630-X *Tuberculosis: Current concepts and treatment* Edited by Lloyd N. Friedman. 366 pp., illustrated. Boca Raton, Fla., CRC Press, 1994. \$179.95. 0-8493-4825-0 *Tuberculosis: Pathogenesis, protection, and control* Edited by Barry R. Bloom. 637 pp., illustrated. Washington, D.C., ASM Press, 1994. \$72. 1-55581-072-1. *New England Journal of Medicine* 332, 1106-1109.
- Mitchell, M.A., 2012. *Mycobacterial Infections in Reptiles. Veterinary Clinics of North America: Exotic Animal Practice* 15, 101-111.
- Reavill, D.R., Schmidt, R.E., 2012. *Mycobacterial Lesions in Fish, Amphibians, Reptiles, Rodents, Lagomorphs, and Ferrets with Reference to Animal Models. Veterinary Clinics of North America: Exotic Animal Practice* 15, 25-40.
- Ryan, T.J., Livingstone, P.G., Ramsey, D.S.L., de Lisle, G.W., Nugent, G., Collins, D.M., Buddle, B.M., 2006. Advances in understanding disease epidemiology and implications for control and eradication of tuberculosis in livestock: The experience from New Zealand. *Veterinary Microbiology* 112, 211-219.

- Shivaprasad, H.L., Palmieri, C., 2012. Pathology of Mycobacteriosis in Birds. *Veterinary Clinics of North America: Exotic Animal Practice* 15, 41-55.
- Thoen, C., LoBue, P., de Kantor, I., 2006. The importance of *Mycobacterium bovis* as a zoonosis. *Veterinary Microbiology* 112, 339-345.
- Ward, A.I., Judge, J., Delahay, R.J., 2010. Farm husbandry and badger behaviour: Opportunities to manage badger to cattle transmission of *Mycobacterium bovis*? *Preventive Veterinary Medicine* 93, 2-10.
- White, P.C.L., Böhm, M., Marion, G., Hutchings, M.R., 2008. Control of bovine tuberculosis in British livestock: there is no 'silver bullet'. *Trends in Microbiology* 16, 420-427.
- Wight, A.E., Lash, E., O'Rear, H.M., Crawford, A.B., 1942. Important General Diseases Common to Several Species. Part 2. Tuberculosis and Its Eradication. Keeping Livestock Healthy, in: *Agriculture, Y.o.* (Ed.). Department of Agriculture, Washington, D.C. USA.
- Wobeser, G.A., 1994. Investigation and Management of Disease in Wild Animals. Springer US.

Publisher's note: EScience Press remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.



Open Access This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license and indicate if changes were made. The images or other third-party material in this article are included in the article's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this license, visit <http://creativecommons.org/licenses/by/4.0/>.

© The Author(s) 2018.