Ministry of higher education And Scientific Research University of AL-Qadisiya Collage of Veterinary Medicine



epidymological Study of pink eye disease in cattle

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بستم ٱلله الرَّحْمَٰن ٱلرَّحِيم

فَتَعْلَى ٱللَّهُ ٱلْمَلِكُ ٱلْحَقَّ وَلَا تَعْجَلُ بِٱلْقُرْءَانِ مِن قَبْلِ أَن يُقْضَى إِلَيْكَ وَحْيَةٌ وَقُل رَّبِّ زِدْنِي عِلْمًا

صدق الله العلي العظيم

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I offer the best states of thanks and appreciation To All who stood beside me in my scientific journey

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To whom who put the optimism in my way and

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Dedication

* To...Of God blessed him prestige and dignity who taught me to tender without waiting for

..... My dear father

* To my angel in life to the meaning of love and the meaning of compassion and dedication

......My dear mother

* To one of the largest of them and adopted on them to ardent candles that illuminate the darkness of my life

......My brothers and sisters

*To the all teachers who illuminate the science to the other minds.

Certificate of supervisor

I certify that this research was conducted under my supervision at the college of veterinary medicine / Al- Qadisiya university as a partial requirement for degree of bachelor in veterinary medicine science .

Lect:

Dr. Ghassan Khudhair

Certification

We certify that Azher jabbar has completed the fulfillment of his graduation project for the year 2016/2017 under our supervision .

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Summary

Pinkeye (infectious bovine keratoconjunctivitis) is a disease affecting cattle caused by the bacteria *Moraxella bovis*. Pinkeye typically affects cattle during the warmer months of the year . (snowder GD.V. *et al*, 2005) .

Pink eye is occure due to increased exposure to the predisposing factors related to this disease. These factors, which include UV light, face flies, dusty environment and plant seed heads, allow for increased transmission of the disease and increased irritation to the eye, making it more vulnerable to disease onset Increased irritation often leads to increased tears, which attract face flies .(Rajesh k. S. *et al*,2009)

The flies move from animal to another, spreading the bacteria that cause the disease. One or both eyes may be affected, and animals of any age are susceptible Pinkeye is one of the most common diseases of cattle. (Sosa v.zunino, 2013)

Pinkeye is a disease principally of the cornea. It occurs initially in one eye but may cross-infect the other eye. Onset of clinical signs may begin one day to two weeks post-infection The clinical presentation of the disease, persistence of infection, and rate of progression will vary from animal to animal under field conditions . (Schnee C, H.,*et al*, 2015).

The financial loss is due to decreased weight gain, increased treatment costs, and market discounts due to eye disfigurement and blindness. Certain strains of *Moraxella bovis* are capable of producing pit-like depressions in conjunctival and corneal epithelial cells causing impaired vision in affected animals. Pinkeye is the most common condition affecting beef heifers, and the second most common disease of nursing calves greater than three weeks old .(Michelle Arnoid,2012)

Chapter One

Introduction

Introduction

Infectious bovine keratoconjunctivitis (IBK), also known as pinkeye, is a common and costly eye disease of domestic cattle , Pinkeye is caused by the bacteria Moraxella bovis It sticks to the surface of the eyeball (cornea) with hairlike projections called pili. Once attached, it releases a toxin that kills the cells on the surface of the cornea, leading to the characteristic corneal ulcers seen with this disease . (snowder GD.V. *et al*, 2005)

Cattle with IBK demonstrate a variety of clinical signs, including increased tear production, sensitivity to light, and ultimately corneal swelling that progresses into corneal ulceration and possible blindness .Very little is understood about the impacts of IBK on animal welfare pain assessment studies demonstrate that it is a painful and irritating condition Economic losses in the beef industry can be tremendous, where a 15.9-kg loss in weaning weight per head has been estimated. In particular, pinkeye vaccines are often ineffective in preventing outbreaks during the summer. (Schnee C, H.,*et al*, 2015)

It is important to understand that many factors are involved in the development of pinkeye, including environment, season of the year, concurrent diseases, the strain of bacteria involved, and the animal's genetic makeup and immune system. (Angelos JA,B.,et al,2007).

This color change usually appears in the center of the eye, and an ulcer may develop in this area. In severe cases, the ulceration can penetrate completely through the entire cornea. This would allow the tissue from the inner eye to prolapse out of the opening . (Jeremy powell,2014)

The most important clinical signs eye inflammation in the cattle are heavy lacrimation and secretions water bold and virological and ulceration from eye swelling eyelid and adhering, whatever you order is obeyed the eye and the inflammation of the cornea with ulcerating. (Tryland M,N.,et al,2009)

Once pinkeye begins, it is highly contagious and can spread rapidly within the herd. Control of contributing factors and prompt, effective treatment in the face of an outbreak are necessary to reduce the spread and limit the damaging effects of the disease. Prevention is based on maximizing herd immune status, minimizing the presence of pathogens, and maintaining an irritant-free environment as much as possible. (Michelle Arnoid,2012)

This study was designed to collection the resending that related with IBK disease and know the aspect that mean by resending and reformed general point of view about this disease.

Chapter Two

- History
- Definition
- Etiology
- Epidemiology
- Clinical Sign
- pathology
- Diagnosis
- Treatment
- Prevention

1-History

The first reports of pinkeye appeared in 1. More than a century later, despite all that is known about how the disease develops, Coles (, 1936) first described a keratoconjunctivitis of ruminants in which agent he called a rickettsial-like 1889931, 1935organism (RLO) was demonstrated in conjunctiva smears. Hardy (1940) and Beveridge (1942) failed to isolate the RLO associated with pink-eye of sheep in eggs or cell culture .

Reid and Anigstein (1945), Dickinson and Cooper (1959), Voigt and Dietz (1962), Farzaliev, Safaralic'va and Casanov (1964) and Plakliotin, Znkharov and Alakhverdiev (1966) isolated this agent from cattle with conjunctivitis .(J.E.Frisch,1975)

Meyer (1967) supported the contention, but the latter workers failed to isolate any trachoma micro-organisms from cattle that showed the pink-eye agent in conjunctival smears .(MichaelH.B.,et al,1998)

Storz, Pierson, Marriott and Chow (1967) isolated chlamydia from a follicular conjunctivitis of cow and photographically illustrated a typical intracytoplasmic chlamydia inclusion, Surman (1968) from conjunctival scrapings of cow with pinkeye (Storz, 1971) their conclusion was that the a etiological agent was a bacterium with fastidious growth requirements, reported that typical inclusions closely resembling those of trachoma and inclusion conjunctivitis were seen in conjunctivial epithelial cells of sheep with infectious conjunctivitis but remarked that the agent was not recovered in eggs due to the presence of *Moraxella spp* in infected washings . (Knud Borge P.,et al,1972) In further investigations *Moraxella spp* were isolated by(gourlay and Thomas (1969) and (Langford and Dorward (1969) from cattle eyes, (Nicolet and Schipper (1969) from (chamois Leach (1970) recorded which were isolated from the eyes of cattle with keratoconjunctivitis were strains of *Moraxella* by McCauley, (Surman and Anderson (1971) and (Barile, by Langford (1971), (Spradbrow and Marley (1971) and (Barile *et al* (1972), (Del Guldice and Tully (1972) from cow from cattle and Klingler.. In some of these studies, examination of conjunctival smears was not recorded. This report describes further studies to support a *Moraxella* etiology of keratoconjunctivitis of ruminant .(Smith P, Blakenship (1990)

2-Definition:

Synonames : (Infectious Keratoconjunctivitis ,pinkeye, New Forest eye, blight)

Infectious Keratoconjunctivitis or commonly known as pink eye is a contagious bacterial disease of the eye. This infection will cause the inflammation of the tissue lining the eyelid, the cornea and conjunctiva ultimately causing ulceration which may progress to produce pain and worsen leading to temporary or permanent blindness . (Angelos JA, S. *,et al*,2007)

pinkeye in cattle, is an economically significant disease which causes pain, may lead to blindness and is an animal welfare concern. *Moraxella bovoculi* is a recently described bacterial species that associates with outbreaks of IBK .(Gould S, D., *et al* 2013)

This new species of *Moraxella* can be distinguished from two other *Moraxella species, M. bovis* and *M. ovis*, on the basis of phenylalanine deaminase activity.(Angelos JA 2015)

4

Pinkeye (infectious bovine keratoconjunctivitis) is a disease affecting cattle caused by the bacteria *Moraxella bovis*. Pinkeye typically affects cattle during the warmer months of the year because increase the fly that transmitted the disease . This is due to increased exposure to the predisposing factors related to this disease.(Jeremy powell,2014)

3-Eitology:

Pinkeye is caused by the bacteria *Moraxella bovis* a Gram-negative, β -haemolytic, aerobic, rod-shaped bacterium, bacteria (*Mycoplasma sp., Chlamydophila sp.*) may be contributors to pinkeye in certain cases. It sticks to the surface of the eyeball (cornea) with hair like projections called pili . (Rajesh K., S. et al ,2009)

Once attached, it releases a toxin that kills the cells on the surface of the cornea, leading to the characteristic corneal ulcers seen with this disease. The organism is located in the eyes and nasal cavities of infected cattle .Cattle are the only known reservoir of Moraxella bovis, pinkeye begins in a herd, it is highly contagious and can spread rapidly by direct contact through nasal and ocular discharges and by vectors such as flies. However, Chlamydia psittaci, a nonmotile, obligate intracellular, gramnegative bacterium, is the most common cause of infectious keratoconjunctivitis,

.(Alexander D: 2010)

4-Epidemiology

Pinkeye is a descriptive name for infectious bovine keratoconjunctivitis (IBK). Cattle are susceptible to pinkeye year round, with most cases occurring in the summer months because present of the fly Affected cattle experience discomfort and gain less weight than cattle without the disease. Outbreaks of the disease frequently are believed to follow the introduction of new cattle .(Sosa v.zunino,2013)

Younger cattle exhibit a higher incidence of the disease than older cattle. Calves with less pigmentation on the eyelid, calves born from younger (2–3years of age) or (older than 8 years of age) dams, and bull calves experience a higher incidence and more severe lesions. (Takele G and Zerihun ,2000)

Contributing Factors:

Many different combinations of these factors working together can occur within one herd at one time

1- UV Light or Sunlight

Ultraviolet light or sunlight causes damage to corneal epithelial cells, allowing the bacteria to penetrate the cornea and multiply. Lack of pigment around the eye allows increased UV radiation to sensitize the eye, resulting in inflammation and infection. (Takele G and Zerihun ,2000)

2- Face Flies

These pests contribute to pinkeye in two ways. First, they irritate the eye when feeding on secretions. Then they efficiently transmit the organism from infected to non-infected animals. These insects may harbor the bacteria on their wings and legs for up to three days after feeding on infected material. (Schnee C, H. *et al*, 2015)

Irritation may be due to dust, trauma or injury, wind, tall grass with seed heads, thick-stemmed hay, or high ammonia levels. Grazing close to thorns, barbed wire, and tufts of dry grass can scratch the cornea. (Alexander D ,2010)

4- Other microorganism

Certain viral diseases (infectious bovine rhinotracheitis or IBR and bovine viral diarrhea or BVD) and bacteria (Mycoplasma sp., Chlamydophila sp.) may be contributors to pinkeye in certain cases 'They either can create the right environment for infection or add to the severity of the disease *Moraxella bovoculi* may play an important role in pinkeye but research has not confirmed this. Other problems, such as physical trauma or trauma due to squamous cell carcinoma, may also predispose the eye to secondary bacterial infection. (Loy JD, Brodersen BW ,2014)

5- Stress

Weaning, commingling, transport, poor nutrition, parasites, and weather are just a few examples of stressors for cattle. Stress tends to decrease the animal's immune response to disease.(Liljebjelke KA, W.,*et al*,2000)

6- Breed

All breeds of cattle can be affected by pinkeye, but some breed differences have been reported. More cases have been reported in Hereford cattle. Lower incidences have been reported in Brahman-type cattle and in cattle with greater pigmentation at the ocular margins. Older cattle appear less susceptible to Moraxella ocular infections compared to cattle two years old or younger. A higher prevalence has been reported in male cattle . (Jeremy powell,2014)

5-Clinical Signs :

Pinkeye is a disease principally of the cornea. It occurs initially in one eye but may cross-infect the other eye. Onset of clinical signs may begin one day to two weeks post-infection The clinical presentation of the disease, persistence of infection, and rate of progression will vary from animal to animal under field conditions . (Schnee C, H.,*et al*, 2015)

One or both eyes may be involved. *M. bovis* exhibits several virulence factors, but only two cause clinical disease: the presence of fimbriae on the bacteria cell surface and the secretion of a betahemolytic toxin which damages the cornea The incubation period is usually two to three days, but has extended to three weeks in experimental trials. (Michelle Arnold,2012)

6-Pathogenesis

Stage 1 – blepharospasm (excessive blinking), photophobia (avoidance of light), conjunctivitis and a lot of watery discharge are the earliest signs of the disease. There is a grey appearance of the cornea due to seepage of inflammatory fluid. The eye discharge starts out watery but can soon become cloudy. If both eyes are involved, the animal may be hesitant to move. Affected cattle have less of an appetite due to pain and a moderate fever . (Alexander D , 2010)

Stage 2 – within 24–48 h after the onset of clinical signs described in stage 1, during the next few days, the outer areas of the cornea become vascularized by the extension of blood vessels at the attachment of the sclera and grow across the cornea. (These blood vessels make the cornea appear pink, which is how the disease received its name) .(Angelos JA, B.,*et al*, 2011)

Stage 3 - Corneal ulceration may develop at this stage. The entire cornea will have a gray-white to yellow color with deep , central ulceration of the cornea within six days . Spreading of the inflammation to the inner eye and filling with fibrin gives the eye a yellowish appearance. Hemolytic *M. bovis* strains produce a pore forming cytotoxin (cytolisin/ hemolysin) that promotes the development of corneal ulcers by lysis (death) of corneal epithelial cells . (Sosa v.zunino,2013)

Stage 4 - Some animals recover spontaneously in three to five weeks- the ulcer heals and reduces, leaving a scar. In some cases the process becomes chronic, and the opacity takes 1–2 months to resolve. In other cases depending on the severity of the disease, a white scar may be present even after full resolution of the disease. Occasionally, perforation of the corneal ulcer results in iris prolapse, in which case, blindness may result .(Snowder GD, V.,*et al* ,2005)

7- diagnosis:

1-clinical signs : Pinkeye is a disease principally of the cornea. It occurs initially in one eye but may cross-infect the other eye. Onset of clinical signs may begin one day to two weeks post-infection The clinical presentation of the disease, persistence of infection, and rate of progression will vary from animal to animal under field conditions . (Schnee C, H.,*et al*, 2015)

2-isolation: swab samples were collected from the infected eyes by two methods a)Gentle streaking of the swab in a horizontal manner through the eye ball.

b) Gentle dipping of the swab in the medial canthus of the eye. (Quinn PJ, M.,*et al*,2002)

3- Serological diagnostic methods: there several method for serological diagnosis

Elisa : To obtain DNA for sequencing, all seven *M. bovoculi* isolates were grown from frozen culture stocks on chocolate agar plates at 37 °C with 5% CO2 for 17–20 h. A single colony for each isolate was then picked and further passaged a minimum of one additional time on chocolate agar. (Angelos JA,2015)

4-Biochemical Tests:

a)Slide Catalase Test: The test is performed by placing a small amount of the bacterial growth of each isolate in the middle of a clean defatted microscope slide. One drop of 3 % hydrogen peroxide (H2O2) was added using a Pasteur pipette to the culture under test. Catalase acts as a catalyst in the breakdown of hydrogen peroxide to oxygen and water. The release of a bubble of oxygen within a few seconds is indicative that the tested organism is catalase positive (Catalase +ve bacteria) because it produces the enzyme catalase. (Quinn PJ, M.,et al,2002)

b) Oxidase Test: Oxidase is a class of enzymes that catalyze the reduction of molecular oxygen independently of hydrogen peroxide. Oxidase test is used to identify bacteria that contain cytochrome oxidase (Moraxella). The test was performed by soaking a piece of filter paper with a few drops of oxidase reagent (10g/L 26 solution of tetra methyl-p phenylenediaminedihydrochloride). A colony of the bacteria to be tested was put on the soaked filter paper. A positive reaction will result in oxidizing the phenylenediaimine in the reagent changing its color to a deep purple (blue purple) within few seconds. If the test was negative there will be no reaction. (Quinn PJ, M., et al, 2002)

8-Treatment

Preventing spread by treating affected animals is the single most important factor in controlling a disease outbreak. Early detection of animals with the first clinical signs (tearing, squinting, and blinking) and then prompt, effective treatment are essential to reducing spread and limiting damage to the eye If possible, isolation of the affected animal away from the herd also will help limit the spread. In cases where a producer is unable to treat new cases quickly, giving an injectable antibiotic to all susceptible animals along with topical fly repellent may be the best course of action to reduce the spread of pinkeye in the herd . (Rajesh K., S. et al ,2009)

Early and effective treatment with the correct antibiotic reduces the duration of the carrier state, when spread usually occurs to unaffected herd mates. Long-acting antibiotics, such as longacting tetracycline or the prescription antibiotic tulathromycin, are labeled for treatment of pinkeye. Your veterinarian may prescribe the antibiotics florfenicol or ceftiofur to be used in an off-label manner for treatment as well Injectable antibiotics are generally the best option because of their long duration of activity and effectiveness in eliminating bacteria . (Conceição FR, B.,*et al*,2004)

Topical sprays only remain in the eye a few minutes before tears wash them away, so application is generally required three to four times daily to be effective. It is difficult for any spray or ointment to remain in the eye long enough to eliminate the bacteria unless treatments are repeated multiple times daily. When severe ulceration exists, either the eyeball may need extra protection with a patch or the eyelids may need to be sutured (stitched) together .(Conceição FR, B.,*et al*,2004)

Patches protect the eye from light, flies and other irritants but they remove the ability to monitor the affected eye. Suturing the eyelids together will physically support the stability of the globe and offers protection from irritants as well. Consult your veterinarian for assistance on how and when to apply these extra protective measures .(W. Mark Hilton, D.V.M.,2002)

9-Prevention and control

Pinkeye is a complicated, multifaceted disease. It is said that "an ounce of prevention is worth a pound of cure," and nowhere is it more appropriate than with pinkeye. The best plan is to reduce or remove as many risk factors as possible in order to keep the eyes healthy and better equipped to fend off disease. Prevention is based on maximizing herd immune status, minimizing the presence of pathogens, and maintaining as irritantfree environment as possible . (Michelle Arnold,2012)

1- Maximize Herd Immune Status

An overall good level of nutrition, adequate vitamin and trace mineral intake, a comprehensive vaccination program including the respiratory viral diseases IBR and BVD, parasite control, and basic biosecurity practices are all exceptionally important in improving the cow's or calf's ability to fight off any disease process (not just pinkeye). There is no scientific evidence to support feeding excessive levels of any vitamin or mineral, including Vitamin A, will prevent diseases of the eye. Biosecurity measures such as quarantine of new arrivals to the farm (including show animals) for three weeks before commingling with the herd are important in case any of these animals is incubating a disease. (Michelle Arnold,2012)

2-Maintain an Irritant-Free

Environment Prevent eye irritation with good face fly control, mow tall grass, provide shade and clean water, and reduce sources of stress (such as overcrowding/overgrazing) if possible. Control face flies with ear tags impregnated with insecticide and topically administered insecticides by way of back and face rubbers or dust bags they must walk under to get to water or mineral Removal of fly breeding grounds and the use of certain feed additives will decrease the number of flies. Provide shade to protect from UV rays .(Tryland M,N.,et al,2009)

3-Minimize the Concentration of M. Bovis (and M. Bovoculi)

Immediate detection and isolation of affected animals followed by effective treatment with long-acting antibiotics will shorten the period of corneal ulceration and speed healing time. Perhaps most importantly, treatment will reduce the duration of the carrier state when recurrence and transmission most often occur. Active cases of pinkeye with excessive tearing attract flies that spread the bacteria so topical application of a fly repellent to the face will help reduce vector spread. Vaccination may help prevent disease and eliminate carriers but vaccines are not consistently effective. Many different commercial vaccines against Moraxella bovis such as Piliguard, (19) (Loy JD, Brodersen BW, 2014)

Chapter

Three

Conclusions

And

Recommendations

1- Conclusions

IBK is a challenging disease for the veterinary practitioner. The multifactorial influences that enhance the disease frustrate both the practitioner and researcher. Treatment is often guided by management practices and preventative measures are limited. Continued research is necessary to further characterize factors that allow M bovis to overcome host defenses and cause disease. Methods to more successfully treat and reliably prevent IBK may be discovered as the defense mechanisms of the bovine eye are further characterized.

2- Recommendations

With successful therapy, an IBK-affected animal will generally seem more comfortable with reduced ocular discharge and improved ability to hold open the eyelids. In outbreak or potential outbreak situations, early recognition of treatment failures is important and should prompt a discussion with the client or herd manager on a variety of topics that cover issues such as how the treatments are being done, whether gloves are being worn, and if equipment is being disinfected between animals.

When vaccines are being used, it is important to stress the importance of proper timing of vaccination relative to when IBK typically occurs in a herd. Although there are widely divergent views on the merits of vaccination for IBK, producers who use vaccines should recognize that the full potential to realize a vaccine benefit is optimized when a vaccine series is initiated at least 4 weeks before the typical IBK season. In any herd setting, IBK is never just an individual animal problem, and identification of IBK should prompt discussions with producers on all aspects of IBK control and prevention, including reduction of potential risk factors for disease (flies, foreign bodies [plant awns, dust], ultraviolet radiation, concurrent infections [Mycoplasma spp, IBR, possibly Mor bovoculi]), vaccinations, and trace mineral status and supplementation.

References

1-Snowder GD, Van Vleck LD, Cundiff LV, et al. 2005. Genetic and environmental factors associated with incidence of infectious bovine keratoconjunctivitis in preweaned beef calves. J Anim Sci ;83:507–18.

2- Rajesh, K., Suresh, K. and Sunder, N.S., 2009. Infectious bovine keratoconjunctivitis in a buffaloclinical and therapeutic aspects, Buffalo Bulletin, 28,110-112.

3- Sosa V, Zunino P: 2013, Diversity of Moraxella spp. strains recovered from infectious bovine keratoconjunctivitis cases in Uruguay. J Infect Dev Ctries 7:819–824.

4- Angelos JA (2015) Infectious bovine keratoconjunctivitis (pinkeye). Vet Clin N Am Food Anim Pract 31:61–79.

5- Michelle Arnold, Veterinary Diagnostic Laboratory, and Jeff Lehmkuhler . (2012) Infectious Bovine Keratoconjunctivitis (Pinkeye) in Cattle ..UNIVERSITY OF KENTUCKY COLLEGE OF AGRICULTURE, LEXINGTON, KY, 40546.ID-135, Animal and Food Sciences

6- Angelos JA, Ball LM, Hess JF. 2007. Identification and characterization of complete RTX operons in Moraxella bovoculi and Moraxella ovis. Vet Microbiol;125:73–9.

7- Jeremy Powell Associate Professor Veterinarian. (2014) . Livestock Health Series Pinkeye.. Agriculture and Natural Resources .. University of Arkansas, United States Department of Agriculture

8- Tryland M, Neves CGD, Sunde M, Mørk T (2009) Cervid herpesvirus 2, the primary agent in an outbreak of infectious keratoconjunctivitis in semidomesticated reindeer. J Clin Microbiol 47:3707–3713

9- J. E. Frisch / Animal Production / Volume 21 / Issue 03 / December 1975, pp 265 - 27

10- Michael H. Brown, Alan H. Brightman, Bradley W. Fenwick, and Maureen A. Rider-(1998) -Infectious Bovine Keratoconjunctivitis -259-266

11- Knud Borge Pedersen, Leif Oddvar Froholm and Kjell Bovre- 1972- FIMBRIATION AND COLONY TYPE OF MORAXELLA BOVIS IN RELATION TO CONJUNCTIVAL COLONIZATION AND DEVELOPMENT OF KERATOCON JUNCTIVITIS IN CATTLE- Acta path. microbiol. scand. Section B. 80, 911-918,

12- Smith P, Blakenship (1990) T. Effectiveness of two commercial infectiousm bovine keratoconjunctivitis vaccines. Am J Vet Res;51: 1147-1150

13- Gould S, Dewell R, Tofflemire K, Whitley RD, Millman ST, Opriessnig T, Rosenbusch R, Trujillo J, O'Connor AM (2013) Randomized blinded challenge study to assess association between Moraxella bovoculi and infectious bovine keratoconjunctivitis in dairy calves. Vet Microbiol 164:108–115

14- Angelos JA (2015) Infectious bovine keratoconjunctivitis (pinkeye). Vet Clin N Am Food Anim Pract 31:61–79

15-Angelos JA, Spinks PQ, Ball LM, George LW (2007) Moraxella bovoculi sp. nov., isolated from calves with infectious bovine keratoconjunctivitis. Int J Syst Evol Microbiol 57:789–795

16- Alexander D: 2010, Infectious bovine keratoconjunctivitis: a review of cases in clinical practice.Vet Clin North Am Food Anim Pract 26:487–503

18- Schnee C, Heller M, Schubert E, Sachse K (2015) Point prevalence of infection with Moraxella spp. in cattle at different stages of infectious bovine keratoconjunctivitis. Vet J 203:92–96

19- Loy JD, Brodersen BW (2014) Moraxella spp. isolated from field outbreaks of infectious bovine keratoconjunctivitis: a retrospective study of case submissions from 2010 to 2013. J Vet Diagn Invest 26:761–768

20- Liljebjelke KA, Warnick LD, Witt MF.2000 Antibiotic residues in milk following bulbar subconjunctival injection of procaine penicillin G in dairy cows. J Am Vet Med Assoc 2000;217:369–71

21- Angelos JA, Ball LM, Byrne BA (2011) Minimum inhibitory concentrations of selected antimicrobial agents for Moraxella bovoculi associated with infectious bovine keratoconjunctivitis. J Vet Diagn Invest 23: 552-555

22- Snowder GD, Van Vleck LD, Cundiff LV, Bennett GL (2005) Genetic and environmental factors associated with incidence of infectious bovine keratoconjunctivitis in preweaned beef calves. J Anim Sci 83: 507–518.

23- Conceição FR, Bertoncelli DM, Storch OB, Paolicchi F, Cobo AL, Gil-Turnes C (2004) Antibiotic susceptibility of Moraxella bovis recovered from outbreaks of Infectious bovine keratoconjunctivitis in Argentina, Brazil and Uruguay between 1974 and 2001. Braz J Microbiol 35: 364-366

24- W. Mark Hilton, D.V.M. School of Veterinary Medicine, Purdue University.(2002).Pinkeye Keratoconjunctivitis of Cattle. Animal Health. VY-33-W

25-Quinn PJ, Markey BK, Carter ME, Donnelly WJ, Leonard FC (2002). Veterinary Microbiology and Microbial Disease. Black well Science, London, pp. 1-251.

الخلاصة:

العين الوردية هو المرض الذي يؤثر على الماشية التي تسببها بوفيس وبوراكسيلا موراكسيلا. عادة ما يؤثر على الماشية خلال الأشهر الأكثر دفئا من السنة . (سنودر GD.V. إت، ٢٠٠٥)

يحدث العين الوردي بسبب زيادة التعرض للعوامل المؤهبة المتعلقة بهذا المرض. هذه العوامل، التي تشمل الضوء فوق البنفسجي، تواجد الذباب، البيئة المغبرة ورئوس بذور النباتات، تسمح لزيادة انتقال المرض وزيادة تهيج العين، مما يجعلها أكثر عرضة لبداية المرض. زيادة تهيج غالبا ما يؤدي إلى زيادة الدموع. (راجيش كس إلت، ٢٠٠٩)

الذباب ينقل الأمراض خلال الانتقال من حيوان إلى آخر، وينشر البكتيريا التي تسبب المرض. قد يتأثر أحد أو كل من العينين، والحيوانات في أي عمر هي عرضة اللاصابه هي واحدة من الأمراض الأكثر شيوعا في الماشية و التي تؤثر على الحالة الأقتصادية في الابقار. (سوسا v.zunino، 2013)

مفاتيح منع ومكافحة تفشي المرض بواسطة التقليل من تركيز البكتيريا موراكسيلا، والحفاظ على بيئة خالية من اي مهيج ممكن. وتتأثر قرارات العلاج بعوامل عديدة مثل فعالية الدواء المختار. (أنجيلوس جا، ٢٠١٥)

موراكسيلا بوفيس هو السبب الرئيسي لمرض العين الوردية ، وينظر إلى هذا المرض على أنه ذو أهمية اقتصادية. وتعزى الخسارة المالية إلى انخفاض في زيادة الوزن، وزيادة تكاليف العلاج، وخصومات السوق بسبب تشوه العين والعمى. بعض السلالات من موراكسيلا بوفيس قادرة على إنتاج الاكتئاب مثل حفرة في الخلايا الظهارية الماتحمة والقرنية مما تسبب في ضعف الرؤية في الحيوانات المتضررة. العين الوردية هي الحالة الأكثر شيوعا التي تؤثر على عجول لحوم البقر، أكثر الأمراض شيوعا في العجول في عمر من ثلاثة أسابيع . (ميشيل أرنويد، ٢٠١٢)