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Contagious Bovine Pleuropneumonia and Its Epidemiological Status in Ethiopia: A Review

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Abstract: This paper aimed to review the epidemiological status of contagious bovinepleuropneumonia (CBPP) in Ethiopia and to high light the control and prevention options. CBPP is an acute or chronic mycoplasmal disease of cattle caused by*Mycoplasma mycoide ssubspecies mycoides* smallcolony types. It is characterized by the presence of sero fibrinous interlobular edema and hepatization giving amarbled appearance to the lung in acute to sub-acute cases and capsulated lesions (sequestra) in the lungs of some chronically infected cattle.It istransmitted by direct contact and inhalation of droplets from lungs especially within susceptible animals. CBPP is disease of major concern throughout sub-SaharanAfrica. CBPP is currently wide spread in Ethiopia. Large endemic areas are found in the South, West, and North-east and North-western parts of the country. The prevalence of CBPP varies according to the epidemiology of the disease aswellas the production system. Aprevalence that varies from 4.3% in Jijiga to 96% inWestern Gojjam has been reported in aperiod between1997 and 2004. Vaccination is the most frequently used control strategyin combination with animal movement control. Animal movement is the major problem for rapid distribution of CBPP in Ethiopia. Therefore, restricting movement of animal, by creating awareness among societies about the diseaseis of aparamount for the success of control program.
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INTRODUCTION

Contagious bovine pleuropneumonia (CBPP) is ahighly infectious acute or chronic disease,primarily of cattle, affecting the lungs and occasionally the joints. It is caused by abacterium, *Mycoplasmamycoide ssubspecies mycoides*s mall colony bovine types (Tambi *et al*., 2004). It is characterized by fibrinous pneumonia, sero-fibrinous pleuritis, and edema of the interlobular septa of the lungs (FAO, 2002).

CBPP is transmitted by direct contact and inhalation of droplets from lungs especially within susceptible animals (Olabode *et al*., 2013). The focus of infection is of ten provided by recovered carrier animals in which apulmonary sequestrum preserves apotential source of organisms for periods as long and three years (Hirsh *et al*., 2004).

Ethiopia is atropical African country in which mobile astoralism is dominant in the arid and semi-arid area in the eastern, northeastern and southeastern parts of the country (Tegegne *et al.,* 2009). Studies undertaken on CBPP sofarrevealed the existence of the disease in different parts of the country with prevalence that varies from 4.3% in Jijiga (Gedlu, 2004) to 96% in Western Gojjam (Yigezuand Roger, 1997). The cattle population at risk of CBPP is estimated to be atotal of 12,641,000. All of the mare considered to be at risk of CBPP, of which 5,510,700 are in endemic zones and 7,815,000 are in epidemic zones (Afework, 2000).

CBPP is considered to be adisease of economic significance because of it sability to increase production costs dueto costs of disease control, disrupt livestock or product trade and reduce sustained investmentin livestock production. Also,it causes high morbidity and mortality losses especially in newly affected areas or among susceptible herds that may show 100% morbidity with mortality exceeding 50% (Tambi *et al*., 2006).

The control of CBPP can be achieved by restriction of animal movement, vaccination and stamping out of infected and exposed animals along with attendant zoo-sanitary measures. The main problems contributing to the current control and eradication were thought to include collapsein Veterinary Services, increased and unrestricted

animal movements dueto drought, waror civil conflicts, and poor vaccine efficacy (Wade *et al*., 2015). To carry out an effective control of CBPP through strategic vaccination the prerequisites area thorough understanding of the epidemiology of the disease in the country (Tambi *et al.,* 2004).

Therefore,the objectives of this seminar paper ware**:**

- To review the epidemiology of CBPP in Ethiopia.
- To forwad the etiology, pathogenesis, clinical sign, diagnosis and treatment of CBPP
- To highlight the control and prevention options of CBPP

CONTAGIOUSB0VINEPLEUROPNEUMONIA (CBPP)

Definitiona nd Etiology

Contagious bovine pleuropneumonia (CBPP) is an acute or chronic respiratory disease of cattle. It is characterized by difficulty in breathing, loss of condition, extensive sero-fibrinous pleurisy and edema of the interlobular septae (Surafel *et al*., 2015).

CBPP is caused by *Mycoplasma mycoide ssubspecies mycoides* Small Colonytypes (*Mmm*SC). Mycoplasmabelongs to the order *Mycoplasmatales* a nd class *Mollicutes* (OIE, 2002). Mycoplasmas have acharacteristic prokaryotic genome consisting of aplasmamembrane, ribosomes and anextremely coiled circular double stranded DNA molecule (Razin, 1999). They are the smallest free-living prokaryotic cells, capable of self replication and pleomorphic organisms ranging from spherical to filamentous. Be cause they cannot synthesiz epeptidoglaycanoritsprecurso rs, they donot possess rigid cellwall but have flexible triple layered outer membranes (Quinn *et al*., 2011). In recent years, more than 20 species of Mycoplasma,Ureaplasma and Acholeplasma have been isolated from cattle with different diseases. All of the 20 species have been referred to as the Mycoplasm as (Nicholas *et al.,* 2000).

The members of the *M.mycoides*cluster includes contagious agalactiae of sheep and goats (*Mycoplasma capricolum subspecies capricolum* and *Mycoplasma mycoides* subspecies *capri*, including the recently reclassified serovar *Mycoplasma mycoides subspecies mycoides* biotype large Colony), contagious bovine pleuropneumonia of cattle (*MmmSC*), and contagious caprinepleuro pneumonia of goats (*Mycoplasma capricolum subspecies capripneumoniae*) which are specially difficult to differentiat edueto phenol typic and genotypic features that cross react serologically. The fifth, recently reclassified *M.mycoides* cluster member, *Mycoplasmal eachii speciesnov*(formerly, *Mycoplasma* species bovine group7of Leach) has been isolated from calves with pneumonia (Righter *et al*., 2011). Among the several species of Mycoplasmafound in cattle,only*Mmm*SCisknownto cause fat alrespiratorydisorders(Masiga *et al*., 1996; Musisi *et al*., 2011). It is anextra cellular pathogen that lives inclose association with the host cells (Westberg *et al.,* 2004).

Epidemiology

HostSusceptibility

Cattle are the primary susceptible species for CBPP, but reports exist of affected water buffalo, yak, bison and reindeer (Provost *et al.,* 1987).There is no difference insusceptibility of Bostaurus and Bosindicus cattle and both races respond equally to vaccination (Radostits *et al*., 1994).The differences that can be observed (inparticular the higher mortality among zebus) are most probably linked to the animal husbandry systems and to herd management than to difference sin susceptibility. Ageis to oimportant. Susceptibility,which is relatively low in young animals, increases as the animal get older and becomes complete after two years. Moreover, the clinical signs are available according to the age as the tropism of *Mmm*SC is directed to the joints in young and to the lungs in animals over two years of age (Lefevre *et al*., 2010).

Occurrence and Geographic Distribution

CBPP was first described in 1550 by Gallo (Seifert, 1996). According to OIE, the disease was present in atleast 27 countries in equatorial, central and Southern Africa. It has also been reported in several countries of the Middle East and in the Arabian Peninsula (Lefevre *et al.,* 2010). CBPP was eradicated from the United States in1892and from Australiain1973. Eradication in both theU.S. and Australiawas dependent on strict control of cattle movement, herd-scales laughter and financial remuneration to owners (Thiaucourt *et al*., 2003). Currently, CBPP is endemic in most parts of East, Central and West Africa and is spreading fast towards the Southern part of Africa especially Zambiaand Namibia,where it is responsiblefor huge economic losses (Musisi *et al.,* 2011).

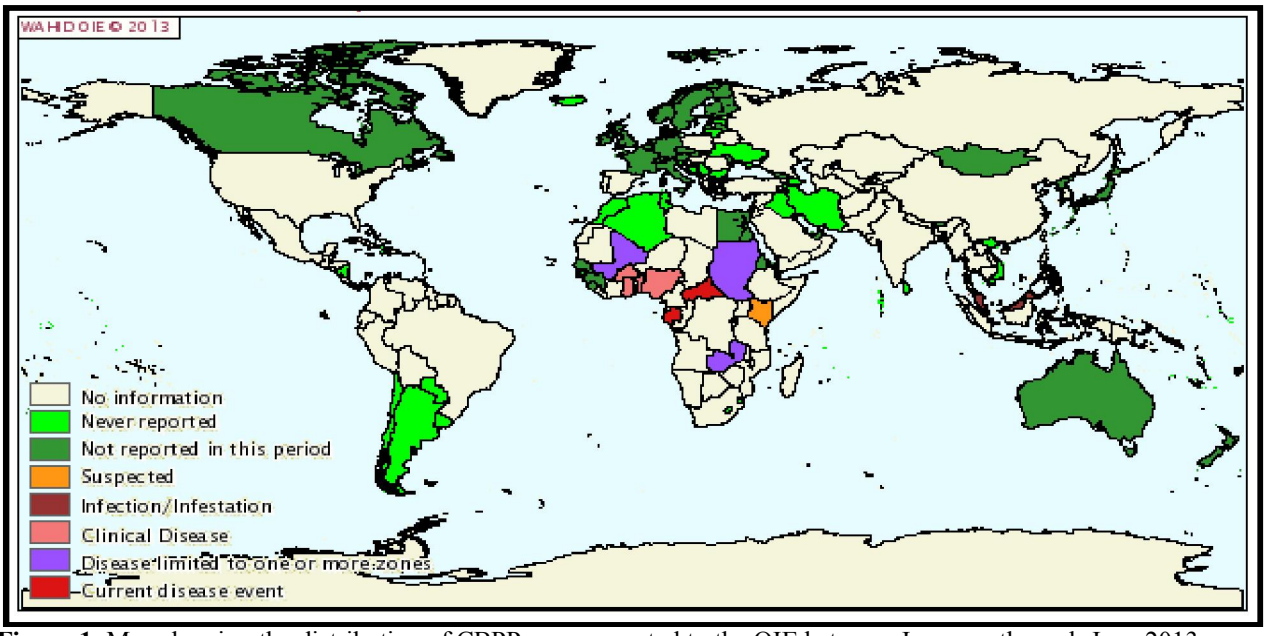

Figure 1: Map showing the distribution of CBPP cases reported to the OIE between Januarys through June 2013. **Source**: OIE World Animal Health Information Database (WAHID) available at www.oie.int/wahis_2/public/wahid.php/Diseaseinformation/Diseasedistributionmap/C

Sources of Infection and Mode of Transmission

CBPP is transmitted by direct contact and inhalation of droplets from lungs especially within susceptible animals. Other factors that enhance the spread of the disease include movement of trade cattle, seasonal migration,and trans-humannomadismas the disease is characterized by severe exudative pleuropnuemonia and pleurisy (Olabode *et al.*, 2013). High stocking densities favor transmission from animal toanimal (Gayles *et al*., 2004). Asdescribed by Radostits *et al*. (2007) aseparation of 6m between animal sisusually considered to be sufficient,but transmission over45m has been suspected to occur. Ingeneral the contagion needs direct contact or contact over short distances (Masiga *et al*., 1996). The disease is no ttransmitted through contact via excreta, animal housing and equipment or vehicles previously occupied by infected animals (Newton and Norris, 2000; Thiaucourt *et al*., 2004).

The main source of infection under natural condition is the excretion of flugge-type droplets by the coughing animal. The organismis also present inurine,semen,fetal fluids and even nasal discharges and act as asource of infection. As mycoplasma survives poorly in the environment, indirect methods of spread (e.g. byfomites) are unimportant (Radostits *et al*., 2007). Many cattle shown disease signs despite being infected and other srecover quickly after atransient mild disease, yet they can carry infection for as long as two years and may be responsible for passing on infection atalaterdate (Musisi *et al.,* 2011). Some animals are called"Lungers"(chronically infected animals with encapsulated lesion sin thelungs) which happens dueto prolonged antibiotic usageleadingtor educed clinical manifestations of thedisease in the animals (Nicholas *et al.,* 2000).

Risk Factors

Animal riskfactors: CBPP occurs only in cattle although rare natural cases have been observed in buffalo,yak,bison,reindeer and antelopes,and the disease has been produced experimentally incaptive African buffalo and white tailed deer. It has not been detected in other wildlife. In sheep and goats the injection of cultures causes alocal cellulitis with out pulmonary involvement (Radostits *et al.,* 2007). Individual cattle differint heir susceptibility toCBPP. Some develop severe"Willem'sreaction"following subcutaneous inoculation of *mycoplasma mycoides*, while others showno signs(Hirsh *et al*., 2004).

Management riskfactors: The occurrence and incidence of CBPP is heavily influenced by management systems (Quinn *et al.,* 2002). Management practices that promote infection include kraaling animals at night and mixing of herds along stock route sandatwatering points (Newton and Norris, 2000). Environmental risk factors that include extremes of temperature,ventilation,dust,ammonia and overcrowding can cause these questrum to break down

and convert the animal in to an active case (Smith, 2009).

Pathogen riskfactors: *Mmm*SC type can be grouped into two major epidemiologically distinct clusters. One cluster contains strains isolated from European countries since1980 and these condcluster contains African and Australian strains collected over last 50years (Vilei *et al*., 2000). *Mycoplasma mycoide ssubspecies mycoides* (*Mmm)* is sensitive to all environment alinfluences, including disinfectants, heat drying and donot ordinarily survive outside the animal body form or ethan afew hours (Hirsh *et al*., 2004).

The pathogen affects the pulmonary tract of adult cattle and buffalos that can lead to severe pulmonary inflammation leaving some animals with hepatised lungs, pulmonary oedema and chronic necrotic sequestra (potential reservoir for diseases pread) (Jores *et al*., 2009).

Pathogenesis

CBPP is an acute lobar pneumonia and pleurisy developing by localization from aninitial septicemia. Anessential part of the disease is thrombosis in the pulmonary vessels, probably prior to the development of pneumonic lesions. The mechanism of development of the thrombosis is not understood, but there is general increase in blood coagubility, and nogeneralized tendency to spontaneous thrombosis. Death results from anorexia and presumably from toxemia (Radostits *et al.,* 2007).

In general the pathogensis of CBPP is still not understood. It is assumed that diffusible toxin provided by (*Mmm*) stimulates fibrous granulation tissue and proliferation resulting in capsule formation around infected necrotic tissue. Acarbohydrate, galactin, the major antigen of *Mmm* increase subsequent infection with life organisnms and has physiological effects similar to those of the endotoxins of gram negative bacteria. Apparently, immunelogically induced celld amage and auoimmune hypersensitivity reactions are also involved in the development of lesions, including agglutinating anibodies which probably cause local lesions in the lung (Seifer, 1996). Mycoplasma membranes containg alactan, acarbohydrate which is found in the form of polysaccharides ,lipopolysaccharides, glycolipids and glycoproteins (Buttery *et al.,* 1976). These carbohydrate components play asignificant rolein the interaction of the organism with the cellmembrane of it shost, and also play arole in it svirulence (Razin, 1999).

Clinical and Necropsy Finding

There is considerable variation in severity of signs observed in cattle affected by CBPP, ranging from hyperacute through acute to chronic and sub-clinical forms. Hyperacute form occurs during the onset of an out break and death may be all that is seen. In some cases the animal may die after one to three days with no signs of pneumonia (Masiga *et al.,* 1996). The acute form is characterized by sudden onset of high fever, anorexia,depression,accelerated respiration and coughing (Quinn and Markey, 2003). In subacute form lesions are localized in small part of the lung, the position of which can not beeasily located by percussion and auscultation. The only symptom is arare cough, sometimes new foci of infection are created and acute symptomssetin. The chronic form is very common and can evolve from the acute form. The affected animals may show unspectacular signs, with mild respiratory distresson exercise,but they can also exhibit aviolent and prolonged cough. The animal may remain in poor condition for along period, depending on the size of the chronic lung lesion. Feverisintermittent and the temperatureisnever high (Shalali, 1997).

At postmortem, the pneumonic lungs have amarbled appearance. Grey and redconsolidated lobules alternate irregularly with pink emphysematous lobules and the interlobular septa are distended and edematous. There may be abundant sero-fibrinous exudates in the pleural cavity (Quinn *et al*., 2011). The most striking feature of the acute disease is the very large volume of yellow fluid (upto 30 liters) containing clots, which can accumulate in the chest and therefore causing breathing extremely difficult. In there covered and chronic form, fluid is rarely seen in the pleural cavity but adhesions between lung lobes and between lungs and the chest wall are commonly found. In farcts, varying in size from about 10-300mm, are frequently presetin the affected lungtissue, which are the result from thrombosis of interorintra-lobulararteries and lymphvessels (FAO, 1997).

Diagnosis

Diagnosis generally employs acombination ofalloranyof the following: clinicalsigns suchas outbreaks of pneumonia,serological tests and post-mortemfindings of affected lungs showing agrossly fibrinous broncho-pneumonia accompanied with pleuritis. The degree of severity varies proportionally according to different conditions (Wesonga and Thiaucourt, 2000). In endemic regions, clinical signs and characteristic postmortem findings apresumptive diagnosis, techniques, suchas the polymerase chain (PCR), based on the detection specific DNA in tissue samples can be used to differentiate Mycoplasma mycoides subspecies mycoides from ot hermembers of mycoidesclusters. The fluorescent antibodytest (FAT) can be used on pleurural fluid to confirm the presence of the pathogen (Quinn *et al.,* 2002).

Treatment

No therapeutic treatment is effective. Antibiotics can have norolein the eradication of CBPP either a tthefarm level,or more importantly, nationally and internationally. Antibiotics can alleviate the clinical course of the disease enabling some improvement in condition. For the individual farmer,particularly the nomadic,this prevents the loss in the form of in come and livelihood. However, atreatment strategy must be balanced against the difficulty created by subclinical carrier cattle spreading the disease across international boundaries which of ten results in explosive out breaks amongs tsusceptible populations. In reality,antibiotics are used and thus adviceis necessary about which one sare effective. An invitrotrial of five commonly used antibioticsonrecent isolates of *Mmm*SCfound that Tilomycosin and Danafloxacin were effective both interms of mycoplasma static and mycoplasmacidal activity. Florofenicol and tetracycline were intermediate,and spectnomycin was in effective against some strains (Radostits *et al.,* 2007).

Treatment is not recommended,because animals remain carriers af tertreatment, however, treatment could be attempted in avaluable animals with Tylosin (10mg/kg body weight, IM, every 12hours for 3-5days) and Oxytetracycline (10mg/kg, IM for 5days) (DACA, 2006).

Control and Prevention

The control methods of the disease relies on the diseasestatusinagiven area (cleanoren zootic), on the mode of animal husbandry (sedentary ornomadic) and on the financial status of the country or even the cattle owners (Shallali, 1997).

Control of Cattle Movement

Control of cattle movement is of critical importance to control CBPP in Ethiopia. The disease may spread insidiously in aherd and may not be detected for several weeks or months after infected animals entered an area. Some animals also have adegree of resistance to the disease and those surviving CBPP are even more resistant. Outbreaks usually begin as aresult of movement of an infected animal into anaïveherd. It is widely believed that recovered animals harboring infectious organism with in apulmonary sequestra may be come active shed ders when stressed (Coetzer *et al*., 1994). Unrestricted animal movements during transhumance, trade, and cattle theft have often facilitated the spread of the disease. The control of cattle movement is the most efficient means to limit the spreads of CBPP (Msami *et al.,* 2001).

Vaccination

Vaccination is the most frequently used control strategy in combination with animal movement control. To be effective, vaccination must be repeated initially at short intervals and there after annually over3-5years (FAO, 2002). Annual vaccination with live attenuated vaccinesis carried out to stimulate effective immunity in cattle in endemic areas (Quinn *et al.,* 2011).

The control of CBPP by vaccination has been carried out for the last 30year sin Ethiopia. Besides, the vaccination coverage was around 50% and did not reach the desired 80–100% level. Currently,CBPP control in Ethiopia was based on targeted and ring vaccination in the face of out breaks (MOA, 1997).

Stamping Out

Stumping out has been termed as the simplest and surest way to control and eradicate CBPP. However, it has farreaching socio- economic effects (Msami *et al*., 2001). Consequently, it is recommended that stumping out should bea strategy of last resort to be used in critical (of asanitary cordon) or major trade routes. It can also be introduced at alatersta ge of the campaign epidemiological situations such as in the case of out breaks in afree area or the surveillance zone after substantial reduction of CBPP incidence such that the incidence is approaching zero (FAO, A1997).

EconomicImportanceofCBPP

CBPP is ahighly infectious cattle disease endemic in many African countries, and the SubSaharan region is under constant threat dueto the carriers tatus of its host (Musisi *et al*., 2011). Dueto high economic losses caused by CBPP in endemic regions, OIE declared CBPP one of the most serious contagious animal diseases and listed it in the group of notifiable animal diseases of high socio-economic impact and is regarded as one of the major transboundary animal diseases (TADs) (Wade *et al*., 2015).

The financia limplications of these losses are of great significance (it has direct and indirect losses) to cattle owners especially in Sub-Saharan Africa with heavy economic impacts on Ethiopia, Ghana, Kenya, Mali, Niger, Tanzania, Nigeria and Uganda and (Olabode *et al*., 2013).

CBPP causes production losses, increases production costs via increased disease control costs, compromises food security through loss of protein and draft power, disrupts livestock and livestock products trade, retards genetic improvement and inhibits sustainable investment in livestock production and causes pain and suffering to animals, causes high morbidity and mortality losses especially in newly affected areas or among susceptible herds that may

show 100% morbidity with mortality exceeding 50%. The CBPP induced productivity losses are associated with significant financial losses to cattle owners (Tambi*et al*. 2006).

In Ethiopia, it has been causing significant economic loss on the agriculture sectors and the national economy. It accounts for aloss of over 206.5million Ethiopian birr per year (Laval, 1999). Thus over the last decades, the country has lost asubstantial market share and foreign exchange earnings dueto frequent bans by the Middle East countries(Belachew and Jemberu, 2003).

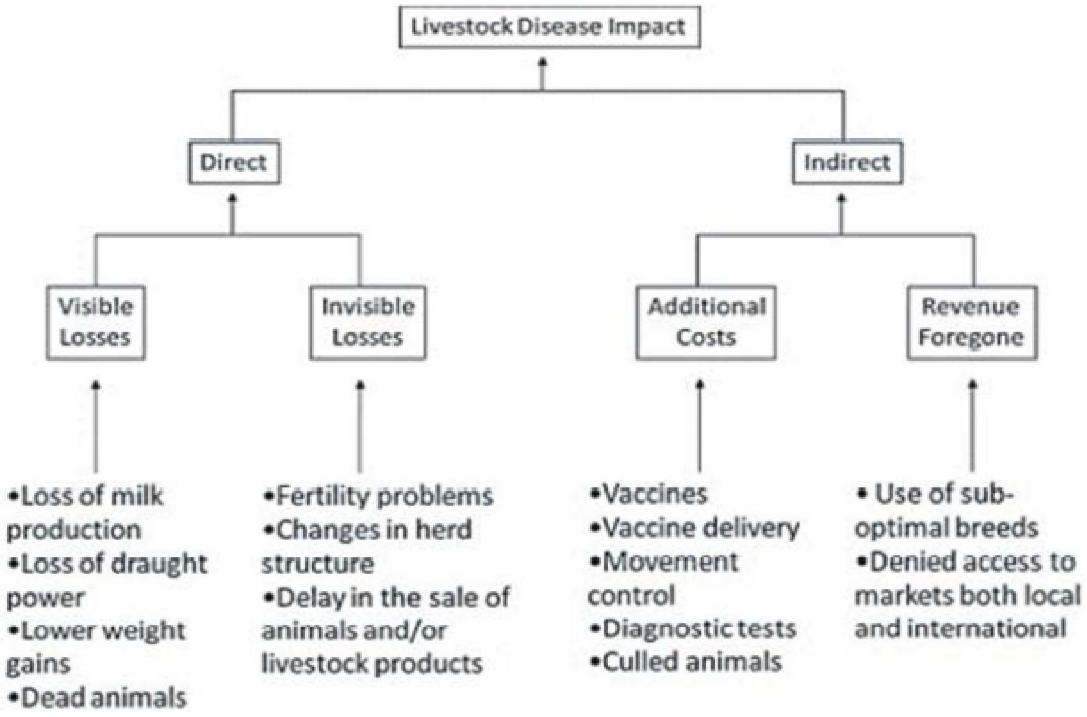

Figure 2: Summary of the economic impact of CBPP (**Source**: James, A.D. and J. Rushton, 2002).

EPIDEMIOLOGY OF CBPP IN ETHIOPIA

Overview of the Epidemiological Status of CBPP in Ethiopia

The origin of CBPP in Central,West and East Africa is obscure and it has been suggested that the infection was introduced by zebu cattle when they first migrated to the African continent. There is asuggestion that CBPP was introduced in to East Africa from India by the army of field Marshal Napier when he invaded Ethiopiain1867-1868 (Masiga *et al.*, 1996).

After rinderpest, the Pan Africa program for the control of epizootics (PACE) has envisaged control of CBPP. In Ethiopia PACE has identified CBPP as the most important disease to address. Sofar there was no systematic country wide approach on CBPP control or eradication like the one implemented for rinderpest in Ethiopia.The overall vaccination coverage declined during the last 10 year sespecially since the cessation of rinderpest vaccination (Desta, 1998).

CBPP is currently wide spread in Ethiopia. Large endemic areas are found in the South,West,and North-eastandNorth-western parts of the country (Desta,1998). Although the previous tudies revealed that the diseas eis more prevalent in lowlands, it can be distributed too ther parts of the country dueto unrestricted animal movement in the country(Surafel *et al*., 2015).

The cattle population atrisk of contracting CBPP in CBPP endemic and epidemic zones of Ethiopia is estimated to be atotal of 12,641,000. All of the mare considered to be atrisk of CBPP,of which5,510,700 are in endemic zones and7,815,000 are in epidemic zones. Generally,based on the available in formation,the epidemiological situation of CBPP found invarious parts of Ethiopia can be summarized as follows (figure1and table1) (Afework, 2000).

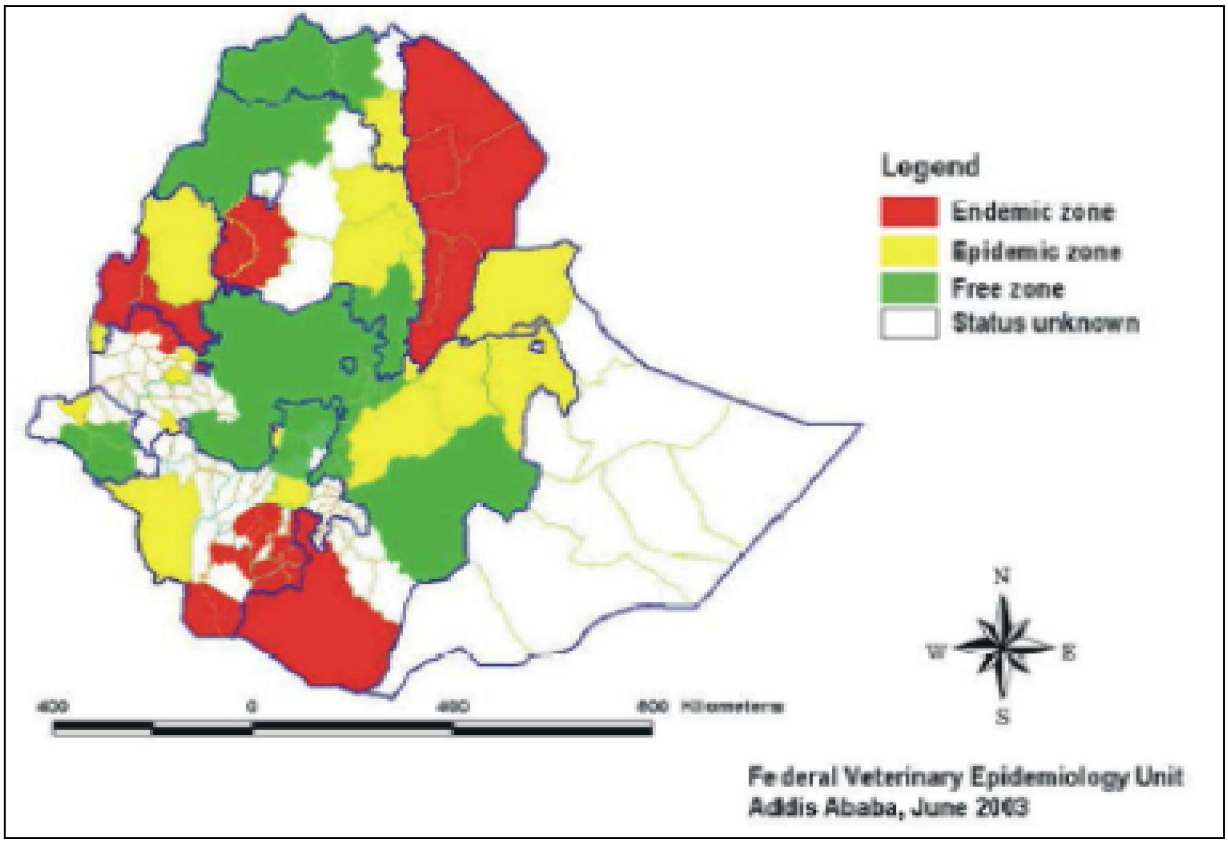

Figure 3:Map showing the different CBPP zones in Ethiopia
Source: Federal VeterinaryEpidemiologyUnit Addis Ababa, June2003

Table 1: CattlepopulationatriskindifferentCBPPaffectedareasofEthiopia

Region	Zone	Cattlepopulation	Productionsystem	Status
Oromia	WesternWellega	1,005,500	MCL	Endemic
	Some parts of WesternWellega	272,700	MCL	Epidemic
	Borena	1,419,000	N	Endemic
	Arsi	2,509,000	MCL	Epidemic
	EasternShoa	1,019,000	MCL	Epidemic
Amhara	WesternGojam	1,188,000	MCL	Endemic
	Awi	470,000	MCL	Endemic
	NorthWello	620000	MCL	Epidemic
	NorthShoa	1,108,000	MCL	Epidemic
Afar	NorthEastern	76,800	N	Endemic
SNNPR	SouthOmo	413,000	MN	Endemic
	KonsoSD	70,000	MCL	Endemic
	DerasheSD	34,000	MCL	Endemic
	AmaroSD	59,000	MCL	Endemic
	NorthOmo	1,715,000	MCL	Epidemic
	Maji	212,000	MN	Epidemic
Tigray	Southern	450,000	MCL	Epidemic
Total		12,641,000		Endemicandepidemic

Key: MCL = Mixed crop livestock, MN = Mixedand Nomadic, N = Nomadic
Source: Gedlu (2004)

The prevalence of CBPP varies according to the epidemiology of the disease aswellas the production system. Higher prevalence occurred during epidemics whereas much lower in endemic situations (Surafel *et a*l., 2015). Anational serological survey performed by NAHDIC (2004) provided an assessment of the incidence and prevalence of the disease (Table 2). Gambella and Benishangul-Gumuz Regional State sappear to be more affected by the disease compared to the other Regions. However,continuous surveillance and monitoring is required to substantiate this claim. During they ears 2002-2010, it was reported that 306 out breaks, 10084 cases and 5284 deaths occurred in different parts of the countryTable 3 (Gulima, 2011).

The highest CBPP outbreak reported in the country occurred in1998 with 187 out breaks, 5,652 cases, and 1,071 deaths (MOA, 2002). It is inferred that overall disease situation is on the decline compared to situations before 2002 However, the disease is still widely distributed and the low prevalence that different studies purport should notsub-serve complacency that would affect the necessary vigilance of mitigating any potential risk which may arise at any one time (EAHYB, 2011).

Table 2: CBPPsero-surveillance performed by the NAHDIC indifferent Regions of Ethiopia showing disease distribution and prevalence rates.

Region	Noof Zones covered	No of Districts covered	Totalsample	Negative	Positive	Prevalence
Afar	3	3	1080	1001	79	7.31
Amhara	9	12	4320	4264	56	1.29
BenshagulGumuz	2	2	720	633	87	12.08
Gambela	1	2	720	578	142	19.72
Oromia	11	20	7140	6730	410	5.74
SNNP	8	8	2700	2553	147	5.44
Somali	2	3	1110	1099	11	0.99
Tigray	2	4	1440	1352	88	6.11
Total	38	54	19230	18210	1020	5.63

Source: Gulima (2011)

Table 3: CBPP out breaks and how they impacted on cattle resource during 2002-2010

Region	No of Zones affected	No of Districts affected	No of out breaks	No of cases
Afar	10	15	18	3235
Amhara	14	14	74	455
BenishangulGumuz	5	6	11	334
Gambela	4	4	5	673
Oromia	30	58	126	2428
SNNP	16	18	59	835
Somali	4	5	7	2839
Tigray	5	5	6	40
Total	88	126	306	10084

Source: Gulima (2011)

CBPP Control Methods in Ethiopia

The major control method practiced in Ethiopia is Vaccination. The control endeavor of CBPP by vaccination has ahistory of about30 years in Ethiopia (Desta,1998). Previously the consecutive yearly blanket vaccination with combined rinderpest and CBPP vaccine was adopted as astrategy tocontrol CBPP. This methodwas consideredasasuccessful achievement in the control of CBPP. Currently,CBPP control in Ethiopia was based on targeted and ring vaccination in the face of out breaks (MOA, 1997).

The major problems to the control and eradication of the disease are difficulty in restriction of animal movement sespecially insub-Saharan Africa, complications of applying quarantine and slaughter policies,lack of rapid penside diagnostic test, in effective vaccine and inadequate funds to implement control policies (OIE, 2014).

CONCLUSIONANDRECOMMENDATIONS

Contagious bovine pleurapneumonia (CBPP) is one of the main problems to cattle health and production indeveloping countries like Ethiopia. It is

an endemic disease in most parts of Ethiopia. The disease is epidemic in certain areas of Ethiopia and considerable amount of out breaks have been reported very year. Some parts of the countryare considered to be free from CBPP, even no disease free area is established sofar. The main control options in Ethiopia are conducted through vaccination, and sometimes control is done by quarantine and restricting movement of animal especially to the area sconsidered free from CBPP. Therefore,based on the above conclusions, the following recommendations are forwarded:

- Restricting movement of animal, by creating awareness among societies about the disease is of aparamount for the success of control program since animal movement is the major problem for rapid distribution of CBPP in Ethiopia.
- Annual vaccination with live attenuated vaccines should be given for cattle in endemic areas to stimulate effective immunity.

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REFERENCES

[1]. Afework,Y. (2000): Analysis of CBPP situation in Ethiopia, past and present Ministry of Agriculture, AddisAbaba, Ethiopia**.**

[2]. Belachew, H. and E. Jemberu. (2003): Challenges and opportunities of livestock marketing in Ethiopia:InYilma,J.and Gatachew, G.(eds), Proceedings of the10 annual conference of the Ethiopian Society Animal Production (ESAP) heldin Addis Ababa, Ethiopia.

[3]. Buttery, C., Lagergard, T. and Titchen, D. A. (1976): Acute respiratory, circulatory and pathological changes in the calf after intravenous injection of the galactan from *Mycoplasmamycoides*subsp. *Mycoides* Small Colony. *Journalof Medical Microbiology, (***9**):379-391.

[4]. Coetzer, J. A. W.; Thomson, G. R. and Tustinr, C. (1994): Infectious diseases of livestock, Oxford University Press.

[5]. DACA, (2006): Drug Administration and Control Authority; Standard Treatment Guidelines for Veterinary Practice. Addis Ababa, Ethiopia, Pp. 78-79.

[6]. Desta, B. (1998): Sero-epidemiological Investigation of CBPP inIllubabur and Wellega (Western Ethiopia), DVM Thesis, Addis Ababa University, Faculty of Veterinary Medicine, Debrezeit, Ethiopia.

[7]. Ethiopia Animal Health Yearbook, (2011): Addis Ababa, Ethiopia.

[8]. FAO, (1997): Recognising CBPP, Afield Manual for Recognition. EMPRESFAO Animal Health Service Animal Production and Health Division Rome, Italy.

[9]. FAO, (2002): FAO Animal Health Manual, Recognizing Contagious bovine pleuropneumonia, FAO, Rome.

[10]. Gayles, C. L., Prescott, J. F., Songer, .g .and Thoen, C. O. (2004): Pathogenesis of bacterial infections in animals. 3rded. USA: Blackwell publishing, Pp.397-440

[11]. Gedlu, M. (2004): Serological, clinical and participatory epidemiological survey of contagious bovine pleurapneumonia in Somali Region, Ethiopia. MSc Thesis, Addis Ababa University, Faculty of Veterinary Medicine, Debrezeit, Ethiopia.

[12]. Gulima, D. (2010): Disease reporting. Presentationon VACNADA Project closes out workshop, Debrezeit, Ethiopia.

[13]. Hirsh, D. C., Yuanchung, Z. and Walker, L. R. (2004): VeterinaryMicrobiology. USA: Blackwell publishingLtd, Pp.166-170.

[14]. James, A .D. and J. Rushton, (2002): The economics of foot and Mouth Disease. Rev. Sci. Tech. off. Int. Epiz, **3**: 637-644.

[15]. Jores, J., Meens, J., Buettner, F. F. R., Linz, B., Naessens, J., and Gerlach, G. F. (2009): Analysis of the immunoproteome of Mycoplasmamycoidessubsp.mycoidessmall colony type reveals immunogenic homologues too ther known virulence traits inrelated Mycoplasmaspecies. *Veterinary Immunology and Immunopathology, **131***(3-4):238-245.

[16]. Laval, G. (1999):.Costanalys is of contagious bovinepleuropneumoniain Ethiopia, Unpublished MScthesis,Claude Bernard University.

[17]. Lefevre, C. P., Blancou, J., Chermette, R. and Uilenberg, G .(2010): Infectious and Parasitic Disease of Livestock. Vol-2, Paris, Pp.791-809.

[18]. Masiga, W. N., Domenech, J.and Windsor, R. (1996): Manifestation and epidemiology of Contagious Bovine Pleuropneumoniain Africa. *Rev. sci. tech. Off. int. Epiz*, **15**(4):1283-130.

[19]. MOA, (1997): Livestock Development project. Ministry of Agriculture, the Federal Democratic Republic of Ethiopia, Addis Ababa, Ethiopia.

[20]. MOA, (2002): Monthly Animal Health Stat us Report, inistry of Agriculture Veterinary Services, EpidemiologyUnit, Addis Ababa, Ethiopia.

[21]. MOA, (2003): Monthly Animal Health Stat us Report: Ministry of Agriculture Veterinary Service, Epidemiology Unit, Addis Ababa, Ethiopia.

[22]. Msami, H. M., Ponela-Mlelwa, T., Mtei, B. J. and Kapaga, A. M. (2001): Contagious Bovine Pleuropneumonia in Tanzania:Current status. *TropicalAnimal Healthand Production*, **33**(1):21-28.

[23]. Musisi, F. L., Dungu, B., Thwala, R., Mogajane, M. E., and Mtei, B. J. (2011): The threat of contagious bovine pleuropneumonia and challenges for its control in the SADC region, from http://www.fao.org/docrep/007/y5510e/y55 10e0d.htm.

[24]. Newton,L.andNorris,R.(2000):Thee radication of bovinepleuropneumoniafrom Australia. Collingwood, Australia: CSIR Opublishing.

[25]. Nicholas, R., Baker, S., Ayling, R., and Stipkovits, L. (2000): Mycoplasma infectionsin growing cattle.*Cattlepractice, **8***(2):115-118.

[26]. Office International DesÉpizooties (OIE), (2002): Manual of Standard for Diagnostic Tests and Vaccines.

[27]. OfficeInternationalDesEpizooties (OIE) Terrestrial Manual, (2014): Contagious bovinepleuropneumonia.

[28]. OlabodeHOK, MailafiaS, AdahBMJ, Nafarnda WD, IkpaLT, JambalangAR, and BelloRH. (2013): Serological Evidence of Contagious Bovine Pleuro-Pneumonia antibodies intrade cattle (BosIndicus) soldin Kwarastate-Nigeria. *OnlineInternational Journalof MicrobiologyResearch.* Volume1, Issue1, Pp.14-19.

[29]. Provost, A, Perreau, P.; Breard, A.; Goffcle; Martel, J. L. and Cottew, G. S. (1987): Contagiousbovinepleuro-pneumonia, Revue Scientifiqueet Technique, Office International desepizootics, **(3):**565–679.

[30]. Quinn, P.J., M.E. Carter, B. Markey and G.R. Carter. (2002): Clinical Veterinary Microbiology, London, Mosby,pp. 320-325.

[31]. Quin, P. J., Markey, B. K. and Maguire, D. (2003): Concise Review of Veterinary Microbiology USA: Blackwell publishing Ltd, Pp.64-65.

[32]. Quinn,P.J.,Markey,B.KF., Leonard, F.C, Fitzpatrick, E.S, Fanning, S, Hartigan, P.J. (2011): Veterinary Microbiology and Microbial Disease. 2nd. USA: Blackwell publishing Ltd, Pp.373-383.

[33]. Radostits,O.M.,Blood,D.C.,Gay,C.C.(1994): VeterinaryMedicine:Atextbookofthediseases ofcattle, sheep, pigs, goatsandhorses. 8thed. London, Baillière Tindall.Pp.910-91.

[34]. Radostits,O.M.,Gay,C.C.,Hinchcliff,K.W.an dConstable,P.D.(2007):Veterinarymedicine: AtextBookofthediseasesofCattle,Horses,She ep, Pigsand Goats. 10thed. London: Pp.673-762.

[35]. Razin,S.(1999):AdherenceofPathogenicMyc oplasmasto Host Cells. *Bioscience Reports, (***19):**5.

[36]. Righter, D.J., Rurangirwa, F.R., Call, D.R., and McElwain, T.F. (2011): Development of abead-basedmultiplex PCR assay for the simultaneous detection of multiple Mycoplasmaspecies. *Veterinary Microbiology, InPress, Accepted Manuscript.*

[37]. Seifert, H. S. H. (1996): Tropical animalhealth. 2nded. The Netherlands: Kluwer Academic Publishers. Pp.332-339.

[38]. Shallali,A. A. (1997): Contagious bovinepleuropneumonia immunity in calves. PhD Thesis, University of Khartoum, Khartoum, Sudan.

[39]. Smith, B. P. (2009):. Large Animal Medicine. 4thed. UnitedStates: Mosby Elsevier, p.338.

[40]. Surafel, K., BiruhtesfaA, HenokG, HunderaS. (2015): SeroPrevalence of Contagious Bovine Pleuropneumoniain Abattoirs at Bishoftu and ExportO riented Feed lots around Adama. College of Veterinary Medicine and Agriculture, Department of Agriculture, Addis Ababa University, Fiche, Ethiopia.G lobal Veterinaria, **15**(3):321-324.

[41]. Tambi, E. N., Maina, O. W. (2004): Regional impact of CBP PinAfrica. In Regional Workshop onValidation of Strategies to Control CBPP in Participative PACE countries. Conakry,Guinea.

[42]. Tambi, N.E., Maina, W.O, Ndi, C. (2006): An estimation of contagious bovine pleuropneumonia: African Union

International Bureau for Animal Resources (AU/IBAR), Nairobi, Kenya, **25** (3): 999-1012.

[43]. Tegegne, A., T. Mengistie, T. Desalew, W. Teka and Dejen, E. (2009): Transhumance cattle production system in North Gondar, Amhara Region, Ethiopia.

[44]. Thiaucourt F, DedieuL, MaillardJ. C, BonnetP, Lesnof fM. (2003): Contagious bovinepleuropneumonia vaccines, historic highlights, present situation and hopes, (**114)**:147-160.

[45]. Vilei, E. M., Abdo, E. M., Nicolet, J., Botelho, A., Gonçalves, R. and Frey, J. (2000): Genomic and antigenic difference sbetween the European and African/Australian clusters of Mycoplasma mycoides subsp. Mycoides SC. Microbiology, (**146):** 477-486.

[46]. Wade,A.,YayaA, El-YugudaAD, UngerH, Nafarnda. (2015): The Prevalence of Contagious Bovine Pleuropneumoniain Cameroon: ACase Study GarouaCentral Abattoir, Cameroun. *Journal of Veteterinary Medicine Research*, **2**(4):1029.

[47]. Wesonga, H. O. and Thiaucourt, F. (2000): Experimental studies on efficacy of T1-SR and T1/44 vaccine strains of Mycoplasmamycoidessubsp. Mycoides Small Colony, (**53):**313-318.

[48]. Westberg, J., Persson, A., Holmberg, A., Go esmann, A., Lundeberg, J., Johansson, K. E., Pettersson, B.,and Uhlen, M. (2004): The genome sequence of *Mycoplasmamycoides* subsp. *Mycoides*SC type strain PG1,the causative agent of contagious bovine Pleuropneumonia, (**14):**221-227.

[49]. Yigezu, L. M .and Roger, F. (1997): CBPP European Union Project component2: Improvement of diagnostic methods competitive ELISA Kit assessment Report of the seconds emester year2. National Veterinary Institute, Ethiopia.

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