ADITUM
Enrich your Research

Journal of Veterinary Medicine And Science
Review Article

Review On Cascading Effects of Reproductive Problems on Cattle Productivity and Reproductivity.

Asledin Mohammed
Department of Veterinary Clinic and Agricultural Staff of Kumbi Woreda, Eastern Ethiopia.

Article Info

Received: August 16, 2024
Accepted: August 20, 2024
Published: August 26, 2024

***Corresponding author:** Asledin Mohammed Department of Veterinary Clinic and Agricultural Staff of Kumbi Woreda, Eastern Ethiopia. Email: drasledin2024@gmail.com

Citation: Asledin M. (2024) "Review on cascading effects of reproductive problems on cattle productivity and reproductivity." Journal of Veterinary Medicine and Science, 1(2); DOI: 10.61148/JVMS/009

Abstract

As in many other countries, livestock, particularly cattle play an important role in Ethiopia as being a source of milk, meat, However, the productivity of indigenous cattle breeds is low due to many constraints including diseases and parasites, nutrition, poor management systems, poor reproductive performance and large socioeconomic factors by decreasing reproductive efficien which means repeat breeding, anoestrus, retained fetal membranes, abortion, uterine prolapsed, and testicular swelling as responded by 26.7%, 20.0%, 5.8%, 5.8%, 28.3%, and 26.7% of the interviewee. Similarly a record of 265 cows was examined to determine the reproductive problems of cattle and associated risk factors and the finding indicated that 19.3% of the cattle have reproductive problems. The major reproductive problems found were 9.1% repeat breeding, 4.2% anoestrus, 3.8% abortion, 1.1% RFM, 0.8% pyometra and 0.4% uterine prolapse. In addition, a total of 414 blood samples for sera were collected from both sexes and greater than 6 months age to determine sero-prevalence and associated risk factors of bovine brucellosis in the study area. Analysis of risk factors of major reproductive problems from the retrospective study showed that except in the case of sanitation and pregnancy status, the overall prevalence of reproductive problems were significantly ($p<0.05$) influenced by breed, location, lactation status, production system, age, parity, body condition score, herd type, herd size and housing system. Generally the current finding revealed that reproductive health problems commonly exist in the study area through their percentage and types vary from time to time; hence, regular reproductive health management and proper formulation of ration could be the possible solutions to alleviate the problems encountered in different production systems.

Keywords: abortion; breed; brucellosis; repeat breeding; anoestrus

Introduction

Cattle production is the main component of agricultural growth in many parts of sub Saharan countries. The overall cost of keeping cattle is associated with the health care, nutrition and reproduction management, however, has not matched to their contribution to the livelihood and economy of the people in sub-Saharan countries. As in many other countries, livestock, particularly cattle play an important role in Ethiopia as being a source of milk, meat, hide, etc (Mekonnen et al., 1989). However, the productivity of indigenous cattle breeds is low due to many constraints including diseases and parasites, nutrition, poor management systems, poor reproductive performance and large socioeconomic factors by decreasing reproductive efficiency, shortening the expected length of productive life and by lowering milk production. Reproductive problems are the most common which occur in lactating dairy cows and can dramatically affect reproductive potential of the dairy herd. Poor reproductive performance is major cause of involuntary culling and therefore reduces the opportunity for voluntary culling and has a negative influence on the subsequent productivity of a dairy herd (Tegegne, 1989; ILCA, 1988, 1998; Hossein-Zadeh, 2013).

The reproductive problems result in heavy economic losses and have been public health concern in dairy farms. Reproductive problems are the main causes of poor productive performance in smallholder dairy farms (Roberts, 1986; Bekena et al., 1994, 1997; Arthur et al., 1996). Among the major reproductive problems that have a direct impact on reproductive performance of dairy cows, retained fetal membrane (RFM), bovine brucellosis, repeated breeding, abortion, anoestrus, dystocia, endometritis, prolapse (uterine and vaginal) and pyometra have been reported to be the most common economic problems (Hadush et al., 2013; Dinka, 2013; Haile et al.,2014). These reproductive problems could also be classified as before gestation (anoestrous and repeat breeding), during gestation (abortion, vagina prolapsed and dystocia) and after gestation (RFM and uterine prolapsed). The impaired function of the reproductive system results failure of a cow to produce a calf yearly and regularly (Arthur et al., 1989; Hoojjar et al., 1999; Shiferaw et al., 2005; Lobago et al., 2006).

It has been reported that among infectious diseases, brucellosis is a common genital disease which induces abortion in animals and humans. Brucellosis is an infectious bacterial zoonotic disease affecting both humans and animals causing a serious economic loss in animal production and deterioration of public health (Arthur et al., 1996; Richey and Dix Harrell, 1997; Moti et al., 2012) by inducing abortion. It is a chronic infectious disease of cattle that causes birth of weak or dead calves, infertility and, as a consequence, reduced milk production (AHA, 2005). Studies conducted in Ethiopia (Shiferaw et al., 2005; Hadush et al., 2013; Dinka, 2013; Haile et al., 2014) revealed poor reproductive performance of dairy cows in many parts of the country.

Statement of the Problem The livestock production system, especially the dairy production, is the most important issue in central zone Oromia region, where dairy cows and their products are the main sources of income and food. Central zone is a large, historical place in the country and majority of the people live concentrated. The zone is also a highly populated area in the region. The demand of dairy and dairy products is coming greater and greater. But production constraints, mainly reproductive health problems, make a bottle neck in its productivity. therefore, it is important to generate useful information on the major reproductive problems of dairy cattle in the study area. Moreover, no investigation has been done on the presence and risk factors of reproductive problems of dairy cattle in the present study area, which gave impetus to the initiation of this study. Thus, the objectives of this study were to determine the prevalence of major reproductive problems of dairy cattle and to identify the possible risk factors for the occurrence of the problems in selected sites of Oromia Region,Ethiopia.

Reproductive Problems of Dairy Cattle:

Reproductive disorders are the most common problems affecting the production and productivity of dairy cows (Dinka, 2013). The presence of the reproductive problems results in considerable economic loss to the dairy industry due to lesser number of calves crop, slower uterine involution, prolonged inter-conception and calving interval, early depreciation of potentially used cows, decreased milk yield per lactation as well as overall lifetime production, and increased costs due to veterinary services and earlier culling of cows (Lobago et al., 2006; FAWC, 2009). Reproductive and production disorders of cross-bred dairy cattle significantly reduce their productivity because of reproductive disorders. These disorders are of great concern of dairy producers because of their effect on the future fertility of dairy cows (Khair et al., 2013). The major reproductive problems that have most important influence on reproductive performance of dairy cows are include abortion, dystocia, RFM, metritis, prolapse (uterine and vagina), mastitis, anoestrus, bovine brucellosis and repeatedbreeding. These reproductive problems could be categorized as prepartum and postpartum reproductive problems (Shiferaw et al., 2005; Lobago et al., 2006; Dinka, 2013; Benti and Zewdie, 2014).

Repeat breeding:

Repeat breeding (RB) is defined as a cow that did not conceive after three or more consecutive inseminations with a fertile bull or fertile semen, despite, it comes normally in heat and shows clear estrous signs with no clinical detectable reproductive disorders or without anatomical abnormalities and infections by exhibiting a variety of reproductive disturbances (Bage et al., 1997; Perez-Marin and Espana, 2007; Yusuf et al., 2010). Repeat breeder syndrome (RBS) is a major economic loss in the dairy industry due togreater insemination costs and increased calving interval. Repeat breeder animals exhibit normal cycle every 18 to 24 days without any clinical abnormalities, but fail to conceive even after at least three successive artificial inseminations (Kumar et al., 2014). The reproductive objective of dairy farms is to produce one calf in a year when dairy cows become pregnant in a single insemination having parturition after 270 days and inseminated again for second pregnancy within two months. But this is not always possible and cows must be re-inseminated many times in several consecutive estrus cycles (Opsomer et al., 1996). Gupta and Deopurkar (2005) reported incidence rate of repeat breeding (5-30%) in cows. Repeat breeding is commonly associated with improper management of reproduction than hormonal inherited problems in the dairy cows (Bage et al., 1997; Perez-Marin and Espana, 2007). Nutritional insufficiency, poor management, natural servicing with sub-clinically infected bulls or heat stress could also be the potential causes of repeat breeding (Ahmed, 2009). Early embryonic deaths in cows may be associated with repeat breeding because of the embryonic mortality mostly occurs earlier in pregnancy. Maurer and Echternkamp (1985) reported that there is a higher prevalence of RBS in heifers (15.1%) than multiparous females (8.3%) in beef cattle. The effective treatment of repeat breeder cows could be uterine lavage plus PGF2α because of some advantages, such as no milk waste or side effects on the endometrium, and may have improved the conception rate (Ahmadi and Dehghan, 2007).

Abortion:

Abortion is defined as the premature expulsion of fetus between 42 days (the estimated time of attachment and approximately 260 days of gestation (the age of the fetus in which fetus can survive outside of the uterus). Abortion is the most common problem of dairy cows which limit the cow's ability to produce a calf yearly and can largely affects the profit of the dairy farm (Peter, 2000). Sarder et al. (2010) also defines abortion as a condition in which fetus is delivered live or dead before reaching the stage of viabilitywhere the delivered fetus is visible by naked eyes. The diagnosis of abortions is a major challenge to the herd owner and veterinarian. There is sudden and dramatic increase of abortion in herds over a long period of time. For this reason, prompt and thorough action is required when abortions do occur. Breeding dates, parity, production information and health events (e.g., disease or vaccination) can all help to identify factors which may be associated with the abortions (Hossein-Zadeh, 2013). Other herd level information such as ration changes, new additions, personnel changes, etc., should also be recorded. Numerous bacterial, viral, protozoan and fungal pathogens have been associated with infertility and abortion in cattle. These pathogens can result in substantial economic losses, indicating the need for control measures to prevent infection or disease. Embryonic or fetal death may result in resorption, mummification, maceration, or abortion. Factors that impact the outcome of embryonic fetal death includes gestation, age, cause of death and source of progesterone for pregnancy maintenance. Aborted fetuses may be autolytic due to death within 24–48 h before abortion (Givens and Marley, 2008).

Bacterial	Fungal	Protozoan	Viral
Campylobacterfetus	*Aspergillusfumigatus*	*Neosporacaninum*	*Bovineherpesvirus1*
Histophilussomni	*Mucorspp*	*Tritrichomanasfetus*	*Bovineviraldiarrhea virus*
Ureaplasmaspp.	*Morteriellawolfii*	*Toxopllasmagondii*	*Bluetonguevirus*
Brucellaabortus *Leptospiraspp.*		*Anaplasmamarginale*	*Epizooticcbovineabortion* *Akabanevirus*
Listeriamonocytogenes			
Arcanobacteriumpyogenes *Chlamydophilaspp*			
Salmonella			
Coxiellaburnetti			

Table 1: Infectious Causes of Abortion in Cattle

The low reproductive efficiency in normal bovine populations is due to abortion. Spontaneous abortion of dairy cows is most common problem that contributes substantially to low herd viability and decreasing production potential by reducing the number of potential female herd replacements and lifetime milk production, and by increasing costs associated with breeding and premature culling (Thurmond et al., 2005). Fetal mortality in pregnant cows between 35 and 45 days of gestation ranges from 8 to 10% (Forar et al., 1996), with abortion often exceeding 14% in some herds (Thurmond et al., 1990; Hossein-Zadeh et al., 2008). The primary focus of abortion is prevention of infectious diseases because of the infectious agents probably cause less than half of the fetal deaths. The cost of abortion depends mainly on the time of gestation, milk production, days in milk, the time of insemination after parturition, the cost of nutrition, sperm costs, insemination time, and labor costs (Rafati et al., 2010). Early pregnancy abortions could result in increased days open. The loss of potential replacement heifers and early culling of productive cows is mainly due to late term abortions. Moreover, extended calving intervals may result in a loss of 2-5% of the herd's potential calf production. Infectious agents (bacteria, viruses, protozoa, and fungi), toxic agents, heat stress, genetic abnormalities (Hovingh, 2009), twin pregnancies (Nielen et al., 1989) and mastitis (Santos et al., 2003) are some of the causes of abortion. Jamaluddin et al. (1996) reported infectious agents (37.1%), noninfectious agents (5.5%) and undetermined causes (57.3%) from 595 abortion submissions in California. The three most commonly diagnosed infectious agents were bacterial (24%), fungal (7%), and viral (6%) as reported by Khodakaram- Tafti and Ikede (2005) in Canada. Control of these infectious factors is achieved by appropriate vaccination programs. The complex vertebral malformation (CVM) gene (Agerholm et al., 2001) is one of the genetic abnormalities that cause abortion in Holsteins which results in malformations from middle to late gestation period. Non-infectious factors such as genetic and nongenetic disorders have been reported in some investigations. The most important non-genetic factors are heat stress, production stress, seasonal effect and seasonal changes (Labernia et al., 1996; Markusfeld- Nir, 1997; Hansen, 2002; López-Gatious et al., 2002; Sani and Amanloo, 2007). The most important genetic disorders include chromosomal and single gene disorders and these disorders resulted in high abortion rate in cows and increased calf sterility (Geoffrey et al., 1992). Cow parity, sire effect, age at conception and abortion history could be some of the non-infectious maternal and paternal factors that cause fetal death (Thurmond et al., 1990, 2005; Markusfeld-Nir, 1997; Hanson et al., 2003; Lee and Hwa Kim, 2007).

Dystocia:

Dystocia is defined as an abnormal and difficult birth in which the first or specially the second stage of parturition was markedly prolonged and subsequently found impossible for the dam to deliver without artificial aid (Benti and Zewdie, 2014). Dystocia is most commonly known as difficult calving and defined shortly as prolonged or difficult parturition is a problem where most of the dairy producers encountered (Mee, 2004, 2008). Improper cervical dilation, failure of uterine expulsive forces (uterine inertia) and neoplasms of vagina, vulva and uterus could be the maternal causes of dystocia in cows (Purohit et al., 2011). Assistance at calving (including lower degrees of difficulties) is much more prevalent, varying from 10% to over half of the calving than severe or considerable difficulty in calving vary from just below 2% to over 22% (Mee, 2008). The fetal oversize and fetal abnormalities are major causes of dystocia. Fetal oversize is common in heifers, cows of beef cattle breeds, prolonged gestations, increased calf birth weight, male calves and perinatal fetal death with resultant emphysema. Monsters, fetal diseases and fetal mal-dispositions are fetal abnormalities resulting in difficulty to deliver such fetuses because of their altered shape. Hydrocephalus, ascites, anasarca and hydrothorax are the most common diseases of fetus resulting in dystocia. The most common cause of dystocia in cattle seems to be fetal maldispositions, of which limb flexion and head deviation appear to be the most frequent (Purohit et al., 2012).

The most common causes of dystocia in dairy cattle results from maternal and foetal factors. Foeto-pelvic incompatibility (FPI) is the most common reason for dystocia which results from a physical incompatibility between the pelvic size of the mother and the size of the calf at birth (Meijering, 1984; Mee, 2008). This is highly influenced by the weight and morphology of the da and the calf, respectively. The pelvic area available at birth is affected by the size of pelvis and fatness of the dam which might partially obstruct the birth canal. The calf's physical factors such as a calf of a big size or mal-presentation contribute to a size of mismatch between the calf and the dam. These morphological factors also depend on different variables including age, breed and parity of the dam, twinning, the sex and weight of the calf, the sire and breed of the calf as well as the nutrition of the dam during gestation (Meijering, 1984; Hickson et al., 2006; Mee, 2008; Zaborski et al., 2009; Hossein-Zadeh, 2010). Lack of uterine contractions (weak labour), incomplete dilation of the cervix and vagina due to stenosis (narrowing and stiffening of the tissue) and uterine torsion are other causes of dystocia exhibiting repelling force to expel a calf during delivery. Hormonal imbalances such as reduction in plasmatic oestradiol concentration, high levels of oestradiol-17ß at parturition or high ratios of cortisol to progesterone are risk factors for the lack of uterine contractions. The hormonal imbalances in the uterus reduce the expression of oxytocin receptors in the uterus by changing the preparation of the soft tissues resulting in weak uterine contractions and weak dilatation of soft tissues (Sorge et al., 2008).

Pyometra: Pyometra is defined as an accumulation of pus in the uterus resulting in infertility and postpartum anoestrus (Ael-G and Fahmy, 2011). In cows; the presence of persistent corpus luteum could be associated with pyometra. In cattle, infectious causes of pyometra includes Campylobacter spp, Staphylococcus spp and Streptococcus spp bacteria, as well L as protozoa including Tritrichomonas spp and Brucella spp (Foldi et al., 2006).

The common clinical signs are decreased milk yield, dullness or other signs of toxemia,including fever and purulent vaginal discharge. Laboratory tests showing a leucocytosis may help to establish a diagnosis (Sheldon et al., 2006). Administration of PGF2α or its analogs at normal luteolytic doses and Lavage of the uterus using large volumes of fluid are the appropriate treatments, but the condition frequently recurs, and permanent cure in these cases requires hysterectomy.

Retained placenta

Retention of placenta is the inability of fetal membrane to be expelled within 8 hrs after parturition and ranging of the retention from 8 to 48 hours post-partum (Beagley et al., 2010). The normal physiological stages of birth during parturition include dilatation of parturient canal, delivery of the fetus and expulsion of the fetal membranes. In normal condition, fetal membranes are usually expelled within two to eight hours of parturition. Any retention of fetal membranes beyond 12 hours could be considered as pathological (Wetherill, 1965). The incidence of retained placenta varies from 4-18% of calving (Paisley et al., 1986; Eiler, 1997; Noakes et al., 2001). The uterus normally contracts approximately fourteen times an hour immediately following parturition but the frequency gradually diminishes to once every hour at 42 hours. Delayed involution of the uterus is usually associated with retention of membranes. Retained placenta had a significant negative effect on milk yield for several weeks after calving (Rajala and Gröhn, 1998; Lucey et al., 1986). The interval from calving to first service and conception were higher in the retained placenta and increases the risk of fatty liver syndrome and ketosis (Han and Kim, 2005).

Retained placenta delays the postpartum resumption of cyclic ovarian function and prolongs the interval from calving to first ovulation (Opsomer et al., 2000). Early or induced parturition, dystocia, hormonal imbalances, and immune-suppression are risk factors in interrupting the normal process resulting in retention of the placenta. Systemic administration of antibiotics can be beneficial in treating metritis and collagenase injection enhances placenta release during fetal retention (Beagley et al., 2010)

Uterine prolapse:

Uterine prolapse is a non-hereditary abnormal complication of the uterus usually expressed as expulsion of the uterus through the vulva to the outside of the body which is occurring immediately after parturition and occasionally up to several hours afterwards (Roberts, 1971; Cuneo et al., 1993). Gustafsson et al. (2004) also defines uterine prolapse as a protrusion of the uterus from the vulva with the mucosal surface exposed. Uterine prolapsed occurs in the third stage oof labour when fetus is expelled and fetal cotyledons separated from the maternal caruncles (Noakes et al., 2001). Uterine prolapse is a common complication of the third stage of labour in the cow during parturition (Joseph et al., 2001). Uterine prolapse is generally a complete inversion of the gravid cornua in ruminants (Arthur et al., 1996). Uterine prolapse is a one the most common obstetrical problem, affecting productive and reproductive performance of cattle by reducing postpartum return to estrus, conception rate and calving interval in dairy cattle (Kumar and Yasotha, 2015). Uterine prolapse is one of the most important complications associated with calving in dairy cows. Uterine prolapsed is usually associated with hypocalcaemia or milk fever, poor uterine tone, increased straining, weight of the retained fetal membrane, tympany and excessive estrogen content in the feed (Jackson, 2004; Hanie, 2006; Kumar and Yasotha,2015).

Cows recovered from uterine prolapse can become pregnant with a post operative fertility rate of 40-60% (Tyagi and Singh, 2002) when treatment is successful. The successful treatment in uterine prolapsed cases depends on type of case, duration of case, degree of damage and contamination. Administration of injectable broad-spectrum antibiotics (Ceftiofur sodium 2mg/kg) for three to five days after replacement of the prolapsed uterus can prevent secondary bacterial infection (Hosie, 1993; Plunkett, 2000; Borobia-Belsue, 2006) so that prolapsed animals could become properly recovered from the problem and can conceive again without problems.

Anoestrus:

Anoestrus is defined as failure of cows to exhibit overt estrus but is more commonly a problem with estrus detection (Johnson, 2008). The anoestrus is usually associated with the presence of inactive ovaries even in the presence of follicular development where none of the growing follicles become mature enough to ovulate (Montiel and Ahuja, 2005). Anoestrus is categorized in to four clinical forms: silent heat; cystic ovarian disease; ovarian afunction and corpus luteum pseudo-graviditatis (Mwaanga and Janowski, 2000; Zdunczyk et al., 2002). Anestrus is a result of managerial, physiological, pathological and nutritional factors. These factors include age, breed, pre- and postpartum nutrition, body condition at calving, milk yield, suckling, calving season, presence or absence of the bull, delayed uterine involution, dystocia and general health status influence duration of postpartum anoestrus (Short et al., 1990; Yavas and Walton, 2000; Webb et al., 2004; Hess et al., 2005; Montiel and Ahuja, 2005; Peter et al., 2009). The incidence of post-partum anoestrus (10-40%) varies from herd to herd as reported by many researchers (Martinez and Thibier, 1984; Mwanga and Janowski, 2000; Zdunczyk et al., 2002). Treatment of anoestrous depends on cause, diagnostic facility, availability and efficiency of drugs, response of the animal to the drug, dose of administration and health status of the animal.

Status of some reproductive disorders of cows in Ethiopia:

Reproductive efficiency is one of the most important factors impacting the profitability of the cow-calf operation and is largely dependent on maintaining a short breeding and calving season and increasing calf crop in the dairy farms (Ahmadzadeh et al., 2011). The high economic loss to the dairy industry occurs due to slower uterine involution during parturition, reduced reproductive rate, prolonged inter-conception and calving interval, negative effect on fertility, increased cost of medication, drop in milk production, reduced calf crop and early depreciation of potentially useful cows (Gebremariam,1996; Lobago et al., 2006). Studies on major reproductive problems ofcattle in different parts of the country has shown the presence of the reproductive problems (Shiferaw et al., 2005; Haftu and Gashaw, 2009; Bitew and Shiv, 2011; Dinka, 2013). The study conducted by Haftu and Gashaw (2009) on major clinical reproductive health problems of 217 cows in and around kumbi of Eastarn Ethiopia showed that 30.4% of the total cows affected with one or more clinical reproductive problems.

A study of the major reproductive health disorders of dairy cows in ILCA and Almaz dairy farms in Ada'a district, Debre Zeit town in East Shoa showed that 37.1% of them had at least one of the reproductive disorders (Esheti and Moges, 2014). Other study conducted in Addis Ababa Milk shed on major reproductive disorders in cross breed dairy cows under small holding indicated that an overall observed prevalence of 67.8% of reproductive health problems (Haile et al., 2010). A study conducted by Dinka (2013) showed that 18.3% of dairy cattle have been affected by either one or more reproductive disorders based on questionnaire interviews in and around Assella in Central Ethiopia. A retrospective study by Hadush et al. (2013) revealed that 44.3% of the cows were found with major prepartum and postpartum reproductive problem from 711 cows in three selected farms in Harar town. Another study conducted by questionnaire and observational survey in urban and per urban area of Hossana indicated that 43.07% of prevalence on major reproductive health problems of dairy cattle (Haile et al., 2014). A study in and around Bedelle showed a prevalence of 26.5% of reproductive problems in South west Ethiopia (Bitew and Shiv ,2011) and 8.7% and 18.3% abortion and retained fatal membrane respectively in selected sites of Arsi zone (Degefa et al., 2011). A prevalence of 40.3% was reported at Kombolcha town in Noth east Ethiopia by Dawit and Ahmed (2013). A study conducted by Gizaw et al. (2007) and Benti and Zewdie (2014) also reported 37.76% and 47.7% in Nazareth town of central Ethiopia and Borena zone in Southern Ethiopia, respectively. A study conducted by Simenew et al. (2011) on major gross reproductive tract abnormalities in female cattle slaughtered at Sululta Slaughterhouse reported 1.6% prevalence rate of pyometra. Reproductive problems are most common in smallholder dairy cows (Gizaw et al., 2007). In order to reduce these problems formulation of strategic control measures,including health education about the disease transmission, treatment and control has to be introduced to reduce reproductive wastage and their risks factors (Dinka, 2013).

Bovine brucellosis:

Brucellosis is a bacterial disease of animals and humans caused by the genus Brucella. Brucella abortus is a contagious disease of cattle, but occasionally sheep, swine, dogs and horses may also be affected. In horses, Brucella abortus together with Actinomyces bovis is commonly present in poll evil and fistulous withers (Roberts, 1971; Radostits et al., 2000).

Epidemiology:

In cattle and other Bovidae, Brucella is usually transmitted from animal to animal by contact following an abortion, pasture or animal barn contamination, ingestion, inhalation, conjunctival inoculation, skin contamination udder inoculation from infected milking cups and the use of pooled colostrums for feeding newborn calves. Sexual transmission and artificial insemination can transmit the disease and semen must only be collected from animals known to be free of brucella infection (FAO, OIE and WHO, 2006).

Etiology:

Brucellosis in cattle is primarily caused by the bacterium Brucella abortus, which is one of six species of the genus Brucella. Nine biotypes have been identified, all of which are intracellular, parasitising, gram-negative and facultative intracellular coccobacillus or short rods. Brucella has a wide host range but cattle are the preferred host of B. abortus (AHA, 2005). Six named species occur in animals: B. abortus, B. melitensis, B. suis, B.ovis, B. canis and B. neotomae. One or more unnamed species of Brucella have been found in marine mammals. Formal names proposed for marine mammal isolates are B. maris for all strains, or B. pinnipediae for strains from pinnipeds (seals, sea lions and walruses) and B. cetaceae for isolates from cetaceans (whales, porpoises and dolphins). Some species of Brucella contain biovars.

Five biovars have been reported for B. suis, three for B. melitensis, and up to nine for B. abortus. Each Brucella species is associated most often with certain hosts. B. abortus usually causes brucellosis in cattle, bison and buffalo (CFSPH and OIE, 2009).

Transmission:

The risk associated with exposure of susceptible animals to the disease following parturition or abortion of infected cattle depends on three factors: the number of organisms excreted, the survival of these organisms under the existing environmental condition and the probability of susceptible animals being exposed to enough organisms to establish infection. B. abortus achieves its greatest concentration in the contents of the pregnant uterus, the fetus and the fetal membranes after birth (Radostits et al., 2000).

In animals, B. abortus is usually transmitted from infected animals to healthy animals by contact with the placenta, fetus, fetal fluids and vaginal discharges. Infected animals after abortion or full-term parturition could be infectious for the other healthy animals. B. abortus may also be present in the milk, urine, semen, feces and hygroma fluids. Shedding in milk may be prolonged or lifelong, and can be intermittent. Many infected cattle can become chronic carriers. Infection with B. abortus can also be transmitted by ingestion or through mucous membranes or through broken skin. Mammary gland is usually colonized during the course of an infection and may be infected by direct contact because of subsequent shedding of the organisms in the milk (CFSPH, 2009). Humans are infected from drinking raw or un-pasteurized infected milk, from exposure to infected discharges or tissues (Roberts, 1971). B. abortus can be spread on through feed, water and by contaminated semen during artificial insemination when semen is deposited in theuterus but not in the mid cervix. In conditions of high humidity, low temperatures, and no sunlight, the Brucella organisms can survive in water, aborted fetuses, manure, wool, hay, equipment and clothes for several months. Brucella species can resist drying and survive in dust and soil if there is an organic material in the environment. Survival rate of Brucella organism is longer in low temperatures especially in deep freezing (CFSPH, 2009).

Immunity Humoral immune:

response Naturally infected animals and those vaccinated as adults with strain 19 remain positive to theserum and other agglutination tests for long periods. The serum of infected cattle contains highlevels of IgG1, IgG2, IgM, and IgA isotypes of antibody (Radostits et al., 2000). Similar isotypes at different relative concentrations occur in milk, although most of the IgA is present in secretory form. The first isotype produced after an initial heavy infection or strain 19 immunization is IgM and is soon followed by IgG antibody. IgG immunoglobulin is the most abundant in serum and exceeds the concentration of IgG2. The magnitude and duration of the antibody response following immunization is directly related to the age at immunization and the number of organisms administered. Following immunization with a standard dose of strain 19 during calf hood, IgG antibody concentrations usually decline to diagnostically insignificant levels over 3-6 months. Residual antibody if present, is usually predominantly of the IgM class. Following exposure to virulent Br. abortus, antibody may appear in 4-10 weeks or longer, depending on the size and route of entry of the inoculums and the stage of pregnancy of the animal. Antibodies of IgG, IgM, IgG1 and IgG2 isotypes can all react in the tube agglutination test, but those of the IgM class are by far the most efficient (WHO, 1986; WHO, 1997; Tolosa, 2004).2.1.9.5.2. Cellular immune response Brucella species are facultative intracellular pathogens. They are readily phagocytised by macrophages and polymorphonuclear leukocytes and, in the case of virulent strains, are capable of surviving within these cells, and phagocytosis is promoted by antibody.

However, since virulent Brucella can survive within normal macrophages for long periods, recovery from infection is likely to be dependent upon the acquisition of increased bactericidal activity by phagocytic cells. Macrophage activation occurs when T-lymphocytes of the appropriate subset are stimulated to release lymphokines (interleukins) (WHO, 1986; WHO, 1997). The release of these activating factors is dependent upon recognition of the appropriate antigen by the T- lymphocyte and is subject to regulation through the major histocompatibility complex. Live organisms capable of establishing persistent intracellular infection and certain types of antigen, with or without adjuvant, are the most effective inducers of cell-mediated immunity. The role of cytotoxic cells, including cytotoxic T-lymphocytes, natural killer (NK), and killer (K) cells, in the cell-mediated immune response to Brucella has not been elucidated. Further studies are also needed to determine the basic processes underlying the development of protective immunity to Brucella in the natural host species (WHO, 1986; WHO, 1997, Tolosa, 2004).

Occurrence and prevalence of infection:

Brucellosis has a worldwide distribution and poses a major threat to sub-Saharan countries including Ethiopia (FAO, 2009). It is one of the economically important diseases in livestock and people in this region. Brucellosis has a considerable impact on animal and human health, as well as wide socio-economic impacts, especially in countries in which rural income relies largely on livestock breeding and dairy products. tabl2.

Clinical signs:

The primary clinical sign of brucellosis is late-term (5–7 months) abortions in cow's and inflammation of the testis (orchitis) and lameness due to bursitis in bull. Sexually immature may remain sub-clinically infected until maturity and pregnancy without showing any sign of the disease (AHA, 2005). Brucellosis should be suspected in flocks and herds when abortions and stillbirths occur in the late term pregnancies without concurrent illness (Radostits et al., 2008 CFSPH and OIE, 2009). In male, localization in the testis, epididymis and accessory sex organs is common, and bacteria may be shed in the semen. This may result in acute orchitis and epididymitis and later in infertility. Arthritis is also observed occasionally in both sexes. Animals generally abort once, although reinvasion of the uterus occurs in subsequent pregnancies and Brucella organisms are shed with the membranes and fluids. In cattle, the consequences of B. abortus include abortions, stillbirths, retention of placenta and weak calves. Retention of placenta and metritis are common sequels to abortion

(Walker, 1999). Females usually abort only once, presumably due to acquired immunity. In general, abortion with retention of the placenta and the resultant metritis may cause prolonged calving interval and permanent infertility. The important signs of brucellosis especially to bulls are Epididymitis, seminal vesiculitis (Weidmann, 1991), orchitis and testicular abscesses. Infertility occurs in males and females due to orchitis /epididymitis or metritis respectively. Hygromas on the leg joints of brucella infected animal is a typical sign of the disease which is resulted due to chronic infection with Br. abortus (Walker, 1999). Arthritis can develop after long-term infections. Systemic signs do not usually occur in uncomplicated infections, and deaths are common in the fetus or newborn (CFSPH, 2009). Walker, 1999) which are elevated in the placenta and fetal fluid from about the fifth month of gestation (Bishop et al., 1994).

The preferential replication of Br. abortus in the extraplacentomal site within trophoblasts of the chorioallantoic membrane results in rupture of the cells and ulceration of the fetal membrane. The damage to placental tissue together with fetal infection and fetal stress will induce maternal hormonal changes. As a result, abortion occurs principally in the last three months of pregnancy, the incubation period being inversely proportional to the stage of development of the fetus at the time of infection (Radostits et al., 2000; Tolosa, 2004).

Pathogenesis:

Following exposure, Brucella penetrates intact mucosal surfaces, and survives and multiplies in cells of the reticuloendothelial system, such as the bone marrow, lymph nodes, liver, spleen, and also kidney (Isselbacher et al., 1980; Walker, 1999). Multiplication of the organisms here may last for several months, resolve itself, or be recurrent for at least two years in 5-10% of animals. Recurrence occurs particularly at the time of parturition. During the bacteraemia, organisms are carried intracellularly in neutrophils and macrophages or free in the plasma and localize in various organs, especially the gravid uterus, udder, and suprammamary lymph nodes. Localization may also occur in other lymph nodes and the spleen, testes, and male accessory sex glands. Occasionally bacterial localization occurs in synovial structures causing a purulent tendovaginitis, arthritis, or bursitis (Bishop et al., 1994). The preferential localization to the reproductive tract of the pregnant animals is due to the presence of unknown factors in the gravid uterus. These are collectively referred to as allantoic fluid factors that would stimulate the growth of Brucella. Erythritol, a four-carbon alcohol, is considered to be one of these factors (Walker, 1999) which are elevated in the placenta and fetal fluid from about the fifth month of gestation (Bishop et al., 1994).
The preferential replication of Br. abortus in the extraplacentomal site within trophoblasts of the chorioallantoic membrane results in rupture of the cells and ulceration of the fetal membrane. The damage to placental tissue together with fetal infection and fetal stress will induce maternal hormonal changes. As a result, abortion occurs principally in the last three months of pregnancy, the incubation period being inversely proportional to the stage of development of the fetus at the time of infection (Radostits et al., immunosorbent assays (ELISAs) are also used (CFSPH and OIE, 2009). Rose bengal plate test This very sensitive test is used to 2000; Tolosa, 2004).

Diagnosis:

The isolation and identification of Brucella offers a definitive diagnosis of brucellosis. It is useful for epidemiological purposes and to monitor the progress of a vaccinationprogrammes in animals (FAO, OIE and WHO, 2006). The method of diagnosis includes the following:

Direct diagnosis microscopic staining:

The disease can be confirmed by demonstration of the bacteria in smears. The smears made from vaginal discharges, placenta, colostrum, foetal stomach fluid or of the aborting cow's lochia, and the abomasum of the aborted fetus using the modified ZiehlNeelsen stain (MZN) (Kusiluka et al., 1996; AHA, 2005; FAO, OIE and WHO, 2006). Impression smears may be taken from freshly cut and blotted tissue surfaces, e.g. cotyledons, by firmly pressing the slide surface against the tissue. Allow to air dry and heat fix. Smears may be made of foetal stomach fluid, cotyledons or lochia and stained with the modified Ziehl-Nielsen stain or Stamp stain. In MZN-stained smears the bacteria appear as red intracellular coccobacilli whereas most other bacteria stain blue.

Bacteriological culture:

All Brucella strains are relatively slow growing, and because the specimens from which isolations best attempted are frequently heavily contaminated, the use of a selective medium, e.g. Farrell's medium is advocated. Incubation normally continues for 72 hours, but a negative diagnosis can only be made after week long incubation. Specimens which may be used for B. abortus isolation include: foetal stomach fluid, spleen, liver, placenta, lochia, milk (especially colostrum or milk within a week of calving), semen and lymph nodes (supramammary (chronic and latent infections) and retropharyngeal (early infections) are preferred, but iliac, prescapular and parotid may be used). If serological reactions are thought to be caused by S19 vaccine strain then it is important to collect prescapular lymph nodes as well. All B. abortus isolates should be forwarded tolaboratories capable of biotyping (IBM, 2013). Farrels' medium and Albimi Brucella medium are selective enriched media for isolation of Brucella species (WHO, 2006; CFSPH, 2009; OIE, 2009).

Indirect diagnosis:

In the absence of culture facilities, the diagnosis of brucellosis traditionally relies on serological testing with a variety of agglutination tests such as the Rose Bengal plate test, the serum agglutination test, and the antiglobulin (Ruiz-Mesa et al., 2005). Detection of antibodies (and at a lesser degree the measure of the cell mediated immunity) against relevant Brucella epitopes is the more practical approach (MacMillan, 1990).

Serology can be used for a presumptive diagnosis of brucellosis, or to screen flocks. Indirect or competitive enzyme-linked
screen serum samples. It does not differentiate between field and S19 vaccine strain reactions, but is quick, inexpensive and easy to

perform. False negative reactions are rare but may sometimes be due to excessive heating in storage or in transit. RBPT has a sensitivity of 98.3% and specificity of 68.8% (Morgan et al., 1969; Dohoo et al., 1996). Positive reactions should be investigated using suitable confirmatory and/or complementary strategies (including the performance of other tests and an epidemiological investigation) (IBM, 2013).

Complement fixation test The CFT is the most widely used test for the serological confirmation of brucellosis in animals. The CFT is both sensitive and specific, in the hands of experienced users, and is used as a definitive (confirmatory) blood serum test. In most cases, the CFT is used on RBPT positive sera, but like the RBPT, it is also affected to a large extent by the misuse of strain 19vaccine, particularly when recent or repetitive vaccinations have been used insexually mature heifers and cows. It is almost impossible to prescribe strict cut-off readings that indicate infection particularly when S19 vaccination reactions play a role due to its misuse. The CFT is a relatively complex test. The reagents include B. abortus CFT antigen, complement, amboceptor (haemolysin), ovine erythrocytes and test serum with Veronal buffer as the diluents (WHO, 2006; IBM, 2013).

Control and eradication:

The treatment of brucellosis in the cow has generally been unsuccessful because of the intracellular sequestration of the organisms in lymph nodes, the mammary gland, and reproductive organs and the bacteria are facultative intracellular which survive and multiply within the cells (Radostits et al., 2000; Tolosa, 2004). Bovine brucellosis is usually introduced into a herd in an infected animal, but it can also enter in semen from infected bulls and on fomites. In endemic areas, vaccinated calves or non-pregnant heifers are the best herd additions in uninfected herds.

Any pregnant or fresh cows should come from brucellosis-free areas or herds, and should be sero-negative. Herd additions should be isolated for approximately a month and retested for B. abortus before they are added to the herd. Selective breeding for disease-resistant genotypes may also be feasible as a control strategy in water buffalo. B. abortus can be eradicated from a herd by test and removal procedures, or by depopulation. Eradication can be accomplished by quarantine of infected herds, vaccination, test-and-slaughter techniques, various forms of surveillance and trace backs. Brucella species are readily killed by most commonly available disinfectants including hypochlorite solutions, 70% ethanol, isopropanol, iodophores, phenolic disinfectants, formaldehyde, glutaraldehyde and xylene; however, organic matter and low temperatures decrease the efficacy of disinfectants. Two B. abortus vaccines, Strain 19 and RB51, can be used to control this disease in endemic areas, or used as part of an eradication program. Routine vaccination is often done in calves to minimize the production of persistent antibodies that can interfere with serological tests (CFSPH, 2009)

Public health significance:

B. abortus is pathogenic for humans. Occupational exposure is seen in laboratory workers, farmers, veterinarians and others who contact infected animals or tissues. Brucellosis is one of the most easily acquired laboratory infections. People who do not work with animals or tissues usually become infected by ingesting unpasteurized dairy products. The Strain 19 B. abortus vaccine is also pathogenic for humans and must be handled with caution to avoid accidental injection or contamination of mucous membranes or abraded skin. Adverse events are also reported with the RB51 vaccine, although it appears to be safer than Strain 19(CFSPH, 2009).

Status of bovine brucellosis in Ethiopia:

Extensive system in Ethiopia covers 95% of the cattle farming. In the last 4 decades, several serological surveys have showed that bovine brucellosis is an endemic and widespread disease in the country. These studies showed that high incidence of brucellosis in pastoral and mixed livestock production systems where people live very closely with livestock and thus, are at higher risk of acquiring the disease (Berhe et al., 2007). The evidences of Brucella infections in Ethiopian cattle have been serologically evaluated in different parts of the country by different authors (Berhe et al., 2007; Tolosa et al., 2008; Asmare et al., 2010; Haileselassie et al., 2010,2011; Adugna et al., 2013). According to some reports, Brucella seroprevalence is higher in intensive farming system than within extensive cattle rearing systems.

In Borena Zone of Oromia Region, the highest seroprevalence (50%) was documented using ELISA in Didituyura Ranch (Alem and Solomon, 2002). Tolosa et al. (2008) reported overall i**ndividual animal prevalence and herd prevalence of 0.77 and 2.9%, respe**ctively in Jimma Zone. Reports from North West, Tigray region (Haileselassie et al., 2010) and Southern Sidama Zone (Asmare et al., 2010), recorded an overall prevalence of 1.2 and 1.66% following screening 848 and 1627 cattle from extensive system, respectively. Another study conducted on cattle brucellosis in traditional husbandry practice from 1623 cattle sera insouthern and eastern Ethiopia showed that 3.5% of the animals and 26.1% of the herds were tested positive (Megersa et al., 2011).

Breed	**Location Ethiopia**	**No. of animals tested**	**Prevalence (%)**	**Tests**	**Reference**
Local	South east	180	1.4	RBPT	Donde,2013
Mixed	West	1813	0.61	CFT	Tolosa, 2004
Mixed	West	1813	0.94	RBPT	Tolosa, 2004
Mixed	Central	1136	11	CFT	Kebede *etal*.,2008
Mixed	Central	1136	12.5	RBPT	Kebede *etal*.,2008
Local	West	1152	1	CFT	Adugna*et al*.,2013

Local	West	1152	1.2	RBPT	Adugna*et al.*,2013
Local	North	1968	4.9	CFT	Haileselassie*etal*., 2010
Mixed	Assela	304	14.14	RBPT	Deselegnand Gangwar, 2011
Mixed	Central	1238	4.9	RBPT	Jergefa*etal*.,2008
Mixed	Central	1238	2.9	CFT	Jergefa*etal*.,2008
Cross	Ambo	169	0.2	RBPT	Bashitu*etal*.,2015
Cross	Ambo	169	0	CFT	Bashitu*etal*.,2015
Cross	Derebrhan	246	0.7	RBPT	Bashitu*etal*.,2015
Cross	Derebrhan	246	0.2	CFT	Bashitu*etal*.,2015
Local	Southeast	862	1.4	RBPT	Gumi*et al*., 2013
Local	Southeast	862	1.4	CFT	Gumi*et al*., 2013
local	Southern	1627	1.66	CFT	Asmare*et al*.,2010
Crossand exotic	Southern	811	2.46	CFT	Asmare*et al*.,2007
Local	EastShowa	1106	11.2	RBPT	Dinkaand Chala,2009
Local	Eastern	435	1.84	RBPT	Degefu*etal*.,2011
Local	Eastern	435	1.38	CFT	Degefu*etal*.,2011
Mixed	EastWollega	406	2.96	RBPT	Yohannes*etal*., 2012

Table 2: Prevalenceof Bovine Brucellosisin Ethiopia

Conclusion And Recommendations:

The current study revealed the high prevalence rate of reproductive health problems in selected sites hararghe zone of oromiya region Repeat breeder, anoestrus and abortion were the most important reproductive problems The possible risk factors associated with the incidence of reproductive problem in the study area includes breed, location, lactation status, production system, age, parity, body condition score, herd type., herd size and housing system. On the other hand, no prevalence of brucellosis was found in the study area. This also reflects the involvement of other possible causes of abortion and retained fetal membranes that pose reproductive wastage in the study area. This may be a clue for the presence of other causes of reproductive diseases.

Based on the current finding the following points are recommended:

 Further investigation should be performed to isolate and characterize the causes of the reproductive problems and associated risk factors in the study area and in the country;

 Regular reproductive health management and proper formulation of ration could be the possible solutions to reduce the problems encountered in different

Production systems:

 Strategic control measures of reproductive diseases had to be formulated based on early control and prevention of the possible causes; Dairy farmers, development agents and veterinarians should get training on dairy cattle management, breeding system, record keeping, and reproductive health management.

Author History

'**Surly, as I have planned, so it will be, and as I have purposed, so it will stand**'

Asledin Mohamed was born in 1990 from his father Mohamed Ahmed his mother Nuriya Yusuf in Eastern Hararghe Zone, Oromia region, Eastern Ethiopia in a district called Bedeno , a place named Gara mulata mountain. He attended his primary school in Aniya starting 1996 and attended his high school in Bedano senior secondary school until 2010. After he completed his high school he joined Jigjiga University University in 2010 and attended Veterinary Medicine until 2016. After graduation he worked in kumbi woreda Bureau of Agriculture, in oromia region as Animal health cordinator until 2019 and also 2020 in position as associate Head of livestock office up to 2022. Currently position as epidemiological servilance expert in Agricultural bureau up to date.

Acknowledgments

Firstily Dedicated to my Mother, Nuriya Yusuf, I grew up under her real with her mothrly love and care, as 3 son of my family. It is always surprising to me that her belief about education was so excited, though she did not receive any formal education. She allowed me to have a new life led by education. More importantly, her far sighted vision, dignified and disciplined personality, enhanced social relationship, positive attitude and hardworking spirit had shaped me and paved the way to my present situations.I wish if she could see my present situation. May GOD wish her long life !.

Secondly Dedicated to my wife, Habsa Riduwan and our children Rayan and Sume , i faced for pursuing my study and for their help and courage during my whole study time. So all were thanks to my almighty next to God for their help in giving me courage to cop up.

As well as great full thanks all professionals supporter from Kumbi woreda Agricultural staff and Jigjiga University for sponsoring veterinary laboratory

References

1. Adugna, K.E.,Agga,G. E.and Zewde,G.(2013): Sero-epidemiologi cal survey of bovine brucellosis in cattle under a traditional production systemin Western Ethiopia. Revue scientifi que et Technique del office international Des Epizooties,32(3):1-20.
2. Ael-G, E. and Fahmy, M.M. (2011): Partial budgeting assessment of the treatment ofpyometra, follicular cysts and ovarian inactivity causing postpartum anoestrus indairycattle. ResearchofVeterinary Science,90(1):44-50.
3. Agerholm, J.S., Bendixen, C., Andersen, O., and Arnbjerg, J. (2001): Complex vertebralmalformation in Holstein calves. Journal of Veterinary Diagnostic Investigation,13: 283-289.
4. AHA (2005): Disease strategy: Bovine brucellosis (version 3.0). Australian VeterinaryEmergencyPlan (AUSVETPLAN), Edition3, PrimaryIndustriesMinisterialCouncil,Canberra, ACT.
5. Ahmadi, M. R. and Dehghan, S. A. (2007): Evaluation of the treatment of repeat breederdairy cows with uterine lavage plus PGF2α, with and without cephapirin. TurkeyJournalof Animal Science, 31 (2):125 – 129.
6. Ahmadzadeh,A.,Carnahan,K.andAutran,C.(2011):Understand ingpubertyandpostpartumanoestru.Proceedings,Boise, Moscow.Pp. 1-16
7. Ahmed,A.M.(2009):SeroprevalenceofcattlebrucellosisinGabil eyDistrict,Somaliland,ThesisresearchsubmittedtoSTVSasapar tialfulfillmentofrequirements for the award of the Diploma in Livestock Health Sciences (DLH),Somaliland, Somalia.
8. Ahmed, F. O. (2009): The efficacy of intra-uterine infusion of Iodine compounds on thereproductive efficiency of postpartum and repeat breeder dairy cows in the Sudan.PhDThesis, Universityof Khartoum, Sudan.
9. Akar,Y. andYeldiz,H.(2005):Concentrationsofsomemineralsincows withretainedplacenta andabortion. TurkeyJournalofVeterinaryand AnimalScience,29:1157-1162.
10. Alem, W. and Solomon, G. (2002): A retrospective sero-epidemiology study of bovinebrucellosis in different production systems in Ethiopia .In: Proceeding of 16thAnnualConference,Addis Ababa, Ethiopia. Pp 53-57.
11. Alemu, F., Admasu, P., Feyera, T. and Niguse, A. (2014): Seroprevalence of BovineBrucellosis in Eastern Showa, Ethiopia. Academic Journal of Animal Diseases,3(3):27-32.
12. Arthur,G.H.,Noakes,D.E.andPearson,H.(1989):Veterinaryrep roductionandobstetrics.Theriogenology, 6thedBaillier, Tindall, UK. Pp. 80-89.
13. Arthur,G.H.,Noakes,D.E.andPearson,H.(1996):Veterinaryrep roductionandobstetrics.Theriogenology, 6thedBaillier, Tindall, UK. Pp. 83-85.
14. Asaminew,T.andEyassu,S.(2009):Smallholderdairyproductio nsystemandemergence of dairy cooperatives in Bahir Dar Zuria and Mecha Woredas, NorthwesternEthiopia.WorldJournalof Dairyand FoodSciences, 4(2):185-192.
15. Asmare,K.,Asfaw,Y.,Gelaye,E.andAyelet,G.(2010):Brucellos isinextensivemanagement system of Zebu cattle in Sidama Zone, Southern Ethiopia. AfricanJournalof Agricultural Research, 5:257-263.
16. Asmare,K.,Shiv,P.,Asfaw,Y.,Gelaye,E.,Ayele,G.,andZeleke, A.(2007):Seroprevalence of brucellosis in cattle and high risk animal health professionals inSidamaZone, Southern Ethiopia.EthiopianVeterinaryJournal,11(2): 59-68.
17. Bage, R., Gustafsson, H., Forsber, M., Larsson, B. and Rodriguez-Martinez, H. (1997): Suprabasalprogesteronelevelsinrepeatbreederheifersduringthe pro-andoestrousperiod. Theriogenology, 47: 141.
18. Bashitu, L., Afera, B., Tuli, G. and Aklilu, F. (2015): Sero-prevalence study of bovinebrucellosisanditsassociatedriskfactorsinDebrebirhanan dAmbotowns.Journalof Advances in Dairy Research, 3:131.
19. Beagley, J. C., Whitman, K. J., Baptiste, K. E. and Scherzer, J. (2010):Physiology andtreatment of retained fetal membranes in cattle: A review.Journal of VeterinaryInternal Medicine, 24:261–268.
20. Beagley, J.C., Whitman, K.J., Baptiste, K.E. and Scherzer, J. (2010): Physiology andtreatment of retained fetal membranes in cattle: Review. Journal of VeterinaryInternationalMedicine,24:261–268
21. Bekena, M., Ekman, T. and Kindhal, H. (1994): Ultrasonography of Bovine postpartumcows with retained fetal membranes. Journal of Veterinary Medicine andAnimalHealth,41: 653-662.
22. Bekena,M.,Jonsson,P.,Kindhal,H.(1997):Bacterialisolateswit hretainedfetalmembranes and subsequent ovarian activity in cattle. Veterinary Record, 140:232-234.
23. Benti, A. D. and Zewdie, W. (2014):Major reproductive health problems of indigenousBorena cows in Ethiopia. Journal of Advanced Veterinary and Animal Research,1(4):182-188.
24. Benti, A. D. and Zewdie, W. (2014): Major reproductive health problems of indigenousBorena cows in Ethiopia.Journal of Advanced Veterinary and Animal Research,1(4):182-188.
25. Berhe, G., Kelay, B., and Yilkal, A. (2007): Seroepidemiological investigation of bovinebrucellosis in the extensive cattle production system of Tigray region of Ethiopia.InternationalJournal of Applied Researchin VeterinaryMedicine, 5(2): 65–71.
26. Bishop,G.C.,Bosman,P.P.andHerr,S.(1994):Bovinebrucellosi s.In:Coetzer,Thomson and Tustin (eds.): Infectious diseases of livestock. Vol.2. Cape Town,RSA:Oxford UniversityPress. Pp. 1053-1066.
27. Bitew,M.andShiv,P.(2011):Studyonmajorreproductivehealthp roblemsinindigenous and cross breed cows in and around Bedelle, South west Ethiopia.Journalof Animal and Veterinary Advances, 10(6):723-727.
28. Borobia-Belsue,J.(2006):Replacementofrectalprolapsedinsows.Veterin aryRecord,36: 380.
29. Bwala,D.G.,McCrindle,C.,Fasina,O.F.andLjagbone,L.(2015):

Abattoircharacteristics and sero-prevalence of bovine brucellosis in cattle slaughtered atBodija Municipal Abattoir, Ibadan, Nigeria. Journal of Veterinary Medicine andAnimalHealth, 7(5):164-168.
30. CFSPH (2009): Bovine Brucellosis: Brucella abortus. College of Veterinary Medicine,IowaStateUniversity, Ames,Iowa.
31. Cuneo, S. P., Card, C. S. and Bicknell, E. J. (1993): Injuries and diseases of beef cattleassociatedwithcalving.AnimalCareandHealthMaintenance.CollegeofAgriculture,The Universityof Arizona, USA.
32. Dawit, T. and Ahmed, S. (2013): Reproductive health problems of cows under differentmanagementsystemsinKombolchaNortheastEthiopia. SchoolofVeterinaryMedicine,HawassaUniversity,Hawassa,Ethiopia.AdvancesinBiologicalResearch,7(3):104-108.
33. Degefa, T., Duressa, A. and Duguma, R. (2011): Brucellosis and some reproductiveproblems of indigenous Arsi cattle in selected Arsi Zone's of Oromia RegionalState,Ethiopia. Global Veterinaria, 7 (1): 45-53.
34. Degefu, H., Mohamud, M., Hailemelekot,M. and Moti, Y. (2011): Seroprevalence ofbovinebrucellosisinagropastoralareasofJijjigazoneofSomali NationalRegionalState,Eastern Ethiopia, Ethiopian VeterinaryJournal, 15(1):37-47.
35. Deselegn, T. B. and Gangwar, S.K. (2011): Seroprevalence study of bovine brucellosis inAsselagovernmentdairyfarmofOromiaRegionalState,Ethiopia.Shortcommunication,International Journal of ScienceandNature, 2(3): 692-697.
36. Dinka, H. (2013): Major reproductive disorders of dairy cows in and around Asella town,Central Ethiopia. Journal of Veterinary Medicine and Animal Health, 5(4): 113-117.
37. Dinka, H. and Chala, R. (2009): Seroprevalence study of bovine brucellosis in pastoraland agro-pastoral areas of East Showa Zone, Oromia Regional State, Ethiopia.American-Eurasian Journal of Agricultural and Environmental Sciences, 6 (5):508-512.
38. Dohoo, L., Martin, W., and Stryhn, H. (2003): Veterinary Epidemiologic Research. AVCInc., University of Prince Edward Island, 550 University Avenue, Charlottetown,PrinceEdwardIsland, Canada. Pp. 335-60.
39. Donde, B. G. (2013): Mycobacteria and zoonoses among pastoralists and their livestockinSouth-East Ethiopia. PhDThesis, Basel University,Switzerland.
40. Duncan, J.R. and.Neilsen, K.(1990). Animalbrucellosis. 1stEd. CRCPress,BocaRaton,USA. Pp: 453.
41. Eiler,H.(1997)Retainedplacenta.In:R.SYoungquist.(Editor),Currenttherapy inlargeanimal. Theriogenology,W.B. Saunders, Philadelphia.Pp. 340-348.
42. Esheti,G. andMoges,N.(2014):Majorreproductive healthdisorders incrossbreeddairy cows in Ada'a District, East Shoa, Ethiopia. Global Veterinaria, 13 (4):444-449.
43. FAO (2009): Animal production and health. Technical meeting in collaboration withWHOand OIE. Rome,Italy.
44. FAO,OIEandWHO(2006):Bucellosisinhumanandanimals.Geneva,Switzerland.Pp.10-35.FAWC(2009):Opinion onthe welfareof thedairycow. London, UK.
45. Földi, J., Kulcsar-Huzenicza, M., Pecsi, A. Huyghe, B. de-Sa, C. D. and Lohuis, J. A.(2006): Bacterial complications of postpartum uterine involution in cattle. AnimalReproductionSciences, 96(3-4):265-281.
46. Folitse,R.D.,Boi-Kikimoto,B.B.,Emikpe,B.O.andAtawalna,J.(2014):Theprevalence of Bovine tuberculosis and Brucellosis in cattle from selected herds inDormaaandKintampoDistricts,BrongAhaforegion,Ghana.ClinicalMicrobiology,5 (2):1-5.
47. Forar, A.L., Gay, J.M., Hancock, D.D. and Gay, C.C. (1996): Fetal loss frequency in tenHolstein dairyherds. Theriogenology, 45: 1505-1513.
48. Gebremariam,T.(1996):"Surveyonmajorprepartumandpostpartumreproductiveproblems of dairy cattle in Mekele and its environments. DVM Thesis, Faculty ofVeterinaryMedicine,AddisAbabaUniversity,DebreZeit,Ethiopia,"unpublished.
49. Geoffrey,H.A.,Noakes,D.E.,Pearson,H.andParkinson,T.J.(1992):Veterinaryreproductionand obstetrics, 6th ed. Saunders Publ.
50. Givens, M. D. and Marley, M.S.D. (2008): Infectious causes of embryonic and fetalmortality. Theriogenology, Pp.1-16.
51. Gizaw, M., Bekana, M. and Abayneh, T. (2007): Major reproductive health problems insmallholderdairyproduction inand aroundNazareth town,Central Ethiopia
52. VeterinaryonlineInternational JournalofVeterinaryMedicine.Accessedon10April,2015.
53. <http://www.fourmilab.ch/rpkp/experiments/analysis/chiCalc.html>
54. Gumi, B., Firdessa, R., Yamuah, L., Sori, T. and Tolosa T. (2013): Seroprevalence ofbrucellosis and Q-fever in Southeast Ethiopian Pastoral Livestock.Journal ofVeterinaryScienceandMedical Diagnosis, 2:1.
55. Gupta, A. G. and Deopurkar, R.L. (2005): Microbial Study of gynaecologicalInfectionincattle. Indian Journalof Animal Reproduction, 14:118-119.
56. Gustafsson, H., Kornmatitsuk, B., Königsson, K. and Kindahl, H. (2004): Peripartum andearly post partum in the cow – physiology and pathology. Proceedings of theWBCCongress, Québec,Canada.
57. Hadush,A.,Abdella,A.andRegassa,F.(2013):Majorprepartumandpostpartumreproductive problems of dairy cattle in Central Ethiopia. Journal of VeterinaryMedicineand Animal Health,5(4):118-123.
58. Haftu, B. and Gashaw, A. (2009): Major Reproductive Health Problems of Dairy Cows inandaroundBako,WestEthiopia.EthiopianJournalofAnimalProduction,9(1):89-98.
59. Haile, A., Kassa, T., Mihret, M. and Asfaw, Y. (2010): Major reproductive disoreders incrossbreddairy cowsunder smallholding inAddisAbaba,Ethiopia.WorldJournalof Agricultural Sciences, 6(4):412-418.
60. Haile,A.,Tsegaye,Y.andTesfaye,N.(2014):Assessmentofmajorreproductivedisordersofdairycattleinurbanandperurbanareaof Hosanna,SouthernEthiopia.Animal and Veterinary Science, 2(5): 135-141.
61. Haileselassie,M.,Kalayou,S.andKyule,M.(2010):Serologicalsurveyofbovinebrucellosis in barka and arado breeds (Bos indicus) of Western Tigray,Ethiopia.PreventiveVeterinaryMedicine, 94(1–2):28–

35.
62. Han, Y. K. and Kim, I. H. (2005): Risk factors for retained placenta and the effect ofretainedplacentaontheoccurrenceofpostpartumdiseasesandsubsequentreproductiveperformanceindairycows.Journalof VeterinaryScience,6:53-59.
63. Hanie, E.A. (2006): Prolapse of the vaginal and uterus: text book of large animal clinicalproceduresforveterinarytechnicians. Elsevier, Mosby. Pp: 218-221.
64. Hansen,P.J.(2002):Embryonicmortalityincattlefromtheembryo'sprospective.JournalofAnimal Science,80(2): 33-44.
65. Hanson, T., Bedrick, E.J., Johnson, W.O. and Thurmond, M.C. (2003): A mixture modelforbovine abortion andfoetal survival.Statisticsin Medicine, 22: 1725-1739.
66. Hess,B.W.,Lake,S.L.,Scholljegerdes,E.J.,Weston,T.R.,Nayigihugu,V.,Molle,J.
67. D.C.andMoss,G.E.(2005):Nutritionalcontrolsofbeefcowreproduction.Journalof AnimalScience, 83(l)90-106.
68. Hickson, R.E., Morris, S.T., Kenyon, P.R. and López-Villalobos, N. (2006): Dystocia inbeefheifers:areviewofgeneticandnutritionalinfluences.New ZealandVeterinaryJournal, 54(6): 256-264.
69. Hoojjer, G.A., Frankena, K.,Varks, M.M.H. and Shuving, M. (1999): Treatment of cysticovarian disease in dairy cows with gonadothrophin releasing hormone. VeterinaryQuarterly,22:33-37.
70. Hosie,B.(1993):TreatmentofVaginalProlapse inEwes.Practice,15:10-11Hossein-Zadeh,G.N.,Nejati-Javaremi,A.,Miraei-Ashtiani,S.R.andKohram,H.(2008): An observational analysis of twin births, calf stillbirth, calf sex ratio, andabortioninIranian Holsteins.Journal of DairyScience, 91: 4198-4205.
71. Hovingh, E. (2009): Abortions in dairy cattle: I. Common causes of abortions. VirginiaCoop.VirginiaPolytechnic InstituteandState University,Blacksburg.
72. IBM(2013):InterimManualforBrucellosisinCattle.Department ofAgriculture,Fisheries and Forestry,Republicof SouthAfrica.
73. ILCA, (1988): Animal reproduction for African countries. Report of a joint seminar byInternational foundation for Science and Swedish international program on animalproduction.ILCA, AddisAbaba, Ethiopia.
74. ILCA, (1998): Animal reproduction for African countries. Report of a joint seminar byInternationalFoundationforScienceandSwedishInternationalProgramonAnimalProduction.InternationalLivestockCenterforAfrica,AddisAbaba,Ethiopia.
75. Isselbacher, J. K., Adams, D.R., Braunwald, G., Sdorf, P. G.R. and Wilson, A.J. (1980):Harrison's:PrinciplesofInternalMedicine.9thedition.Sydney:Graw-HillInternationalBook Company. Pp.658-660.
76. Jackson,P.G.G.(2004):Postparturientproblemsinlargeanimals. Handbookofveterinaryobstetri cs.2ndEd., ElsevierSaunders. Pp: 209-231.
77. Hossein-Zadeh, G. N. (2010): The effect of twinning on milk yield, dystocia, calf birthweightandopendaysinHolsteindairycowsofIran.Journalof AnimalPhysiologyand Animal Nutrition, 94: 780-787.
78. Hossein-Zadeh, G. N. (2013): Effects of main reproductive and health problems on theperformance of dairy cows: A review. Spanish Journal of Agricultural Research,11(3):718-735.
79. Jamaluddin,A.A.,Case,J.T.,Hird,D.W.,Blanchard,P.C.,Peauroi,J.R.andAnderson,
80. M.L.(1996):DairycattleabortioninCalifornia:evaluationofdiagnosticlaboratorydata.Journalof Veterinary DiagnosticInvestigation, 8: 210-218.
81. Jergefa, T., Kelay, B., Bekana, M., Teshale S., Gustafson, H. and Kindahl, H. (2009):Epidemiological study of bovinebrucellosisin three agroecologicalareas of CentralOromiya,Ethiopia.RevuescientifiqueetTechniquedeloficeinternationalDes Epizooties, 28 (3):933-943.
82. Johnson,W.H.(2008):Managinganovulationandcysticovariesindairycows.Advancesin DairyTechnology,20: 311-326.
83. Joosten, I., Vaneldik, P., Eving, L. andVandermey, G. L. W. (1987): Factors related tothe etiology of retained placental in dairy cattle. Animal Production Science, 14:251-262.
84. Joseph, C., Kulasekar, K., Balasubramanian, S.,Kathiresan, D., Veerapandian, C. andPattabiraman,S.R.(2001):Anunusualcomplicationofpost-partumuterineprolapsein a shebuffalo-acasereport.IndianVeterinaryJournal, 78:57-58.
85. Kang'ethe,E.K.,Arimi,S.M.,Omore,A.O.,McDermott,J.J.,Nduhiu,J.G.,Macharia,
86. J.K. and Githua, A. (2000): The prevalence of antibodies to brucella abortus inmarketed milk in kenya and its public health implications. Presentation at the 3rdAllAfricaConferenceonAnimalAgriculture, Nairobi, Kenya.
87. Kebede, T., Ejeta, G. and Ameni, G.(2008): Seroprevalence of bovine brucellosis insmallholder farms in central Ethiopia (Wuchale-Jida district). Revue de MedecineVeterinaire,159 (1): 3-9
88. Khair, A., Alam, M. M., Rahman, M. A., Islam, M. T., Azim, A. and Chowdhury, E.H.(2013): Incidence of reproductive and production diseases of cross-bred dairycattleinBangladesh. BangladishJournal ofVeterinaryMedicine,11(1):31-36.
89. Khodakaram-Tafti, A. and Ikede, B.O. (2005): A retrospective study of sporadic bovineabortions, stillbirths, and neonatal abnormalities in Atlantic Canada, from 1990 to2001.Canadian Veterinary Journal, 46: 635-637.
90. Kumar,A.S.andYasotha,A.(2015):Correctionandmanagement oftotaluterineprolapse in a crossbred cow. Journal of Agriculture and Veterinary Sciences,8(1):14-16.
91. Kumar, M., Pant, S.S., Ram, R., Kumar, S. and Gupta, P.K. (2014): Therapeutic efficacyof levofloxacin along with vitamin E for the management of repeat breedingsyndromeincowunderfieldcondition.InternationalJournalofVeterinaryScience, 3(): 155-157.
92. Kusiluka, L.J.M. and Kambarage, D.M. (1996): Diseases of small ruminants in SubSaharanAfrica.AHandbookofAnimalHealthProgramme.OverseasDevelopmentAdministrationand Vetaid.CapitalPrint Ltd,Scotland.Pp.30-40.
93. Labernia, J., López-Gatius, F., Santolaria, P., Lopez-Bejar, M. and Rutllant, J. (1996):Influenceofmanagementfactorsonpregnancyattritionindairycattle.Theriogenology

45: 1247-1253.
94. Lee, J. and Kim, H. I. (2007): Pregnancy loss in dairy cows: the contributing factors,effectonreproductiveperformanceandtheeconomicimpact.JournalofVeterinaryScience, 8(3): 283-288.
95. LIVES (2013): Processes, descriptions and potential commodity interventions in centralzoneof Tigray. Compiled byWoldewahid G.andWeldemariam D. Pp.1-63.
96. Lobago,F.,Bekana,M.,Gustafsson,H.andKindahl,H.(2006):Reproductiveperformances of dairy cows in smallholder production system in Selalle, CentralEthiopia.Tropical Animal Health and Production, 38:333-342.
97. López-Gatius,F.,Santolaria,P.,Yániz,J.,Rutllant,J.andLópez-Béjar,M.(2002):Factors affecting pregnancy loss from gestation day 38 to 90 in lactating dairycowsfrom asingle herd.Theriogenology, 57: 1251-1261.
98. Lotthammer, K.H. (2005): Comparative studies of the course of mineral, metabolite,enzyme and hormone levels in blood serum ante partum in dairy cows with andwithout later retained placenta. Deutsche Tierarztliche Wochenschrifte, 90: 427-433.
99. Lucey,S.,Rowlands,G.J.andRussell,A.(1986):Shorttermassociationsbetweendiseaseandmilkyieldofdairycows.Journalof DairyResearch,53: 7-15.
100. MacMillan,A.(1990):Conventionalserologicaltests.Animalbrucellosis.CRCPressInc.Pp. 153–198.
101. Makita, K., Fèvre, E. M., Waiswa, C., Eisler, M.C., Thrusfield, M. and Welburn, S. C.(2011): Herd prevalence of bovine brucellosis and analysis of risk factors incattle in urban and peri-urban areas of the Kampala economic zone, Uganda.VeterinaryResearch, 7:60.
102. MarkusfeldNir,O.(1997):EpidemiologyofbovineabortionsinIsraelidairyherds.PreventiveVeterinary Medicine, 31:245-255.
103. Martinez,J.andThibier,M.(1984):Fertilityinanoestrousdairycowsfollowingtreatmentwithprostaglandin F2αorthesyntheticanaloguefenprostalene.VeterinaryReords, 115:57–59.
104. Maurer,R.R.andEchternkamp,S.E.(1985): Repeatbreederfemales inbeef cattle:influencesandcauses.Journalof AnimalScience,61: 642-636.
105. Mee,J.F.(2004):Managingthedairycowatcalvingtime.VeterinaryClinicsofNorthAmericaFood Animal Practice, 20(3): 521-546
106. Mee,J.F.(2008):Prevalenceandriskfactorsfordystociaindairycattle:areview.VeterinaryJournal,176(1): 93-101.
107. Megersa, B., Biffa, D., Niguse, F., Rufael, T., Asmare, K. and Skjerve, E.(2011): Cattlebrucellosis in traditional livestock husbandry practice in Southern and EasternEthiopia,and itszoonoticimplication.ActaVeterinaria Scandinavica,53:24.
108. Meijering, A. (1984): Dystocia and stillbirth in cattle – A review of causes, relations andimplications. LivestockProduction Science, 11(2):143-177.
109. Mekonnen, G., Forsido, T., Gebre-wold, A., Dagnachew, Z. and Anteneh, A. (1989): TheEthiopian Livestock Industry: Retrospect and prospect. IARproceedings, AddisAbaba, Ethiopia.Pp 9-19.
110. Mekonnen,G.,Forsido,T.,Gebrewold,A.,Dagnachew,Z.,andAnteneh,A.(198):The Ethiopian Livestock Industry: Retrospect and prospect.IAR proceedings,AddisAbaba, Ethiopia. Pp. 9-19.
111. Mesafint, M. and Guesh, N. (2014): Repeat Breeder Syndrome in Dairy Cows: Influenceof Breed and Age on Its Prevalence. World Journal of Agricultural Sciences, 10(4):200-203.
112. Montiel, F. and Ahuja, C. (2005): Body condition and suckling as factors influencing theduration of postpartum anestrus in cattle: a review. Animal Reproduction Science,85: 1–26.
113. Morgan, W.J.B., MacKinnon, D.J., Lawson, J.R. and Cullen, G.A. (1969): The rosebengal plate agglutination test in the diagnosis of brucellosis. Veterinary Record,85: 636-641.oti, Y., Mersha, T., Degefu, H., Tolosa, T. and Woyesa, M. (2012): Bovine brucellosis:serological survey in Guto-Gida District, East Wollega Zone, Ethiopia. GlobalVeterinaria,8 (2): 139-143.
114. Moti, Y., Mersha, T., Degefu, H., Tolosa, T. and Woyesa, M.(2012):Bovine brucellosis:serological survey in Guto-Gida District, East Wollega Zone, Ethiopia. GlobalVeterinaria,8 (2): 139-143.
115. Muma, J. B., Syakalima, M., Munyeme, M., Zulu, V. C., Simuunza, M. and Kurata, M.(2013): Bovine tuberculosis and brucellosis in traditionally managed livestock inSelectedDistrictsofSouthernProvinceofZambia.Veterinary MedicineInternational,Hindawi PublishingCorporation.
116. Mwaanga, E. and Janowski, T. (2000): Anoestrus in dairy cows: causes, prevalence andclinicalforms.Reproduction in DomesticAnimals, 35: 193–200.
117. Nielen,M.,Schukken,Y.H.,Scholl,D.T.,Wilbrink,H.J.andBrand,A.(1989):Twinning in dairy cattle: a study of risk factors and effects. Theriogenology, 32:845-862.
118. Noakes, D. E., Parkinson, T. J. and England, G. C. W. (2001): Veterinary ReproductionandObstetrics. Saunders,Pp. 383-472.
119. OIE (2009): Ovine and caprine brucellosis. Manual of Diagnostic Tests and Vaccines forTerrestrialAnimals. OfficeInternationaldes Epizooties, Paris.
120. Omer, K. M., Assefaw, T., Skjerve, E., Tekleghiorghis, T., and Woldehiwet, Z.(2002):PrevalenceofantibodiestoBrucellaspeciesriskfactorrelatedtohighriskoccupationalgroups inEritrea.Epidemiolgy and Infection, 129:85-91.
121. Opsomer, G., Grohn, Y.T., Hertl, J., Coryn, M., Deluyker, H., Kruif, A. (2000): Riskfactorsfor postpartumovariandysfunctioninhighproducing dairy cowsinBelgium:a field study.Theriogenology, 53: 841-857.
122. Opsomer, G., Mijtem, P., Coryn, M. and Kruif, A.D. (1996): Post-partum anoestrus indairycows: A review.Veterinary Quarterly, 18(2): 68-75.
123. Paisley, L. G., Mickelson, W. D. and Anderson, P. B. (1986): Mechanisms andtherapyforretainedfetalmembranesanduterineinfectionsofcows:Areview.Theriogenolgy, 25:353-381.
124. PerezMarin,C.C.andEspaña,F.(2007):Estrusexpressionandovarianfunctioninrepeatbreedercows,monitoredbyultrasonographyandprogesteroneassay.Reproductionin DomesticAnimals,42:449456.Peter,A.T.(2000):Abortionsindairycows:newinsightsandeconomicimpact.Advancesin DairyTechnology, 12: 233.
125. Plunkett, S.J. (2000): Vaginal edema (hyperplasia) or prolapse and uterine prolapse. Textbook of emergency procedure for

the smallanimalveterinarian, WB Saunders,Pp: 217-218.
126. Purohit, G. N., Barolia, Y., Shekhar, C. and Kumar, P. (2011):Maternal dystocia in cowsandbuffaloes: areview.Open Journalof Animal Sciences,1(2): 41-53.
127. Purohit, G. N., Kumar, P., Solanki, K., Shekher, C. and Yadav, S. P. (2012): Perspectivesof fetal dystocia in cattle and buffalo. Veterinary Science Development, 2(8): 31-42.
128. Radostits, O. M., Blood, D. C. and Gay, C. C. (2008): Veterinary Medicine. 9th ed.W.B.SaundersCo., Philadelphia
129. Radostits,O.M.,Gay,C.C.,Blood,C.D.,Hinchcliff,K.W.(2000): VeterinaryMedicine, Textbook of the Disease of Cattle, Sheep, Pigs, Goats and Horses. 9thedition.New York: W.B.Saunders Companyltd. Pp. 867-882.
130. Rafati, N., Mehrabani-Yeganeh, Hansonb, T.E. (2010): Risk factors for abortion in dairycows from commercial Holstein dairy herds in the Tehran region.PreventiveVeterinaryMedicine, 96:170-178.
131. Rajala,P.J.andGrohn,Y.T.(1998):Effectsofdystocia,retainedplacenta,andmetritisonmilkyield in dairycows.Journalof DairyScience, 81: 3172–3181.
132. Richard,W.(1993):Dairying.TropicalAgriculturalist,1sted.MacmillanPress,London.Pp.43-48.
133. Roberts, J.S. (1971): Veterinary Obstetrics and Genital Diseases. 2nd edition. India: CBSPublisherand Distributors. Pp108-313.
134. Roberts,S.J.(1986):Veterinaryobstetricsandgenitaldiseases.Theriogenology.3rded.Edwards'sbrothers,Inc.,Michhigan.Pp.48-104.
135. Ruiz-Mesa, J.D., Sanchez-Gonzalez, J., Reguera, J.M., Martin, L., Lopez-Palmero, S. andColmenero, J.D. (2005): Rose Bengal test: Diagnostic yield and use for the rapiddiagnosisofhumanbrucellosisinemergencydepartmentsin endemicareas.ClinicalMicrobiologyandInfection, 11:221–25.
136. Sani, M. B., Amanloo, H. (2007): Heat stress effect on open days in Holstein dairy cattleinYazdprovince,Iran.3rdCongof AnimalScience, Mashhad,Iran.Pp: 85.
137. Santos, J.E.P., Juchem, S.O., Galvao, K.N. andCerri, R.L.A. (2003): Transition cowmanagement to reduce metabolic diseases and improve reproductive management.Advancesin DairyTechnology, 15: 287-305.
138. Sarder, M.J.U., Moni, M.I.Z. and Aktar, S. (2010): Prevalence of reproductive disordersof cross breed cows in the Rajshahi district of Bangladesh. Journal of Agriculture,8: 65-75.
139. Senein, A. and Abdelgadir, A. E. (2012): Serological survey of cattle brucellosisinEldein,easternDarfur,Sudan.AfricanJournalofMicrobiologyResearch,6(31):6086-6090.
140. Sheldon, I.M., Lewis, G.S., LeBlanc, S. and Gilbert, R.O. (2006): Defining postpartumuterinediseaseincattle.Theriogenology, 65:1516-1530.
141. SheyNjila,O.Daouda.,Nya,E.,Zoli,P.A.,Walravens,K.,Godfroid,J.,Geerts,S.(2005): Serological survey of bovine brucellosis in Cameroon. Revue d'Elevageetde MedicineVétérinaireDes Pays Tropicaux, 58 (3):139-143.
142. Shiferaw, Y., Tenhagen,B.A., Bekana,M. and Kassa,T.(2005): Reproductive disorders ofcrossbred dairy cows in the central highlands of Ethiopia and their effect onreproductiveperformance. TropicalAnimalHealthand Production,37:427-441.
143. Short, R. E., Bellows, R. A., Staigmiller, R. B., Berardinelli, J. G. and Custer, E. E.(1990):Physiologicalmechanismscontrollinganestrusandinfertilityinpostpartumbeef cattle. Journal of AnimalScience, 68:799-816.
144. Simenew, K., Bekana, M., Fikre, L., Tilahun, Z. and Wondu, M. (2011): Majorgrossreproductivetractabnormalitiesinfemalecattleslaughteredat SulultaSlaughterhousein Ethiopia.Global Veterinaria, 6(6):506-513.
145. Sorge, U.S., Kelton, D.F. and Staufenbiel, R. (2008): Short communication: Prepartalconcentrationofestradiol 17betainheiferswithstillborncalves.JournalofDairyScience, 91(4): 1433-1437.
146. Swai, E. S. and Schoonman, L. (2010): The Use of Rose Bengal PlateTest to assesscattleexposuretobrucellainfectionintraditionalandsmallholderdairyproductionsystemsofTangaRegionofTanzania.VeterinaryMedicineInternational,Hindawi PublishingCorporation.
147. Tegegne,A. (1989): Reproductive developmentand function inZebuand cross bredcattleinEthiopia.PhDThesis,JamesCooks University of theNorthQueensLand,Australia.
148. ThrusfieldM.(2007):Samplingin VeterinaryEpidemiology. 3rded.BlackWell Science Ltd, London.46-65:228-242.
149. Thurmond, M.C., Branscum, A.J., Johnson, W.O., Bedrick, E.J. and Hanson, T.E.(2005):Predictingtheprobabilityofabortionindairycows:ahierarchicalBayesianlogistic-survival model using sequential pregnancy data. Preventive VeterinaryMedicine,68: 223-239.
150. Thurmond, M.C., Picanso, J.P. and Jameson, C.M. (1990): Considerations for use ofdescriptive epidemiology to investigate fetal loss in dairy cows. Journal of theAmericanVeterinaryMedical Association, 197: 1305-1312.
151. Tolosa,T.F.(2004):Prevalencestudyofbovinebrucellosisandits publichealthsignificanceinselectedsitesofJimmaZone,Western Ethiopia.AThesissubmittedtotheFaculty ofVeterinary Medicine,AddisAbabaUniversity inpartial fulfillment of the requirements for the Degree of Master of Science inTropical VeterinaryMedicine
152. Tyagi,R.P.S.and Singh,J.(2002):A Textbookofruminant surgery,1stEdit.
153. Unger, F., Münstermann, S., Goumou, A., Apia, C. N., Konte, M. and Hempen, M.(2003):Riskassociatedwithbovinebrucellosisinselectedstudyherdsandmarket places in four countries of West Africa animal health working paper 2.InternationalTrypanotoleranceCentre,Banjul,TheGambia.
154. Walker, R.L.(1999):Brucella.In: Dwight C.Hirsh and Yuang Chung Zee(ED.):VeterinaryMicrobiology. Blackwell ScienceInc.USA. Pp.196-203.
155. Weidmann, H. (1991): Survey of means now available for combating brucellosis in cattleintropics.InstituteforScientificCooperation,Tubmgen,GeorgHauser,Metzingen,Germany. 33: 98-111.
156. WHO(1986):JointFAO/WHOCommitteeonbrucellosis.6thReport.Geneva:WHO.(TechnicalReport Series.740).
157. WHO(1997):Emergingandothercommunicable

diseasesurveillanceandcontrol.Thedevelopment of new/ improved brucellosis vaccines (Reports of the WHOMeetings,Geneva). Pp. 1-37.
158. Webb, R., Garnsworthy, P. C., Gong, J. G. and Armstrong, D. G. (2004):Control offollicular growth: Local interactions and nutritional influences. Journal of AnimalScience,82(1.): 63-74.
159. Wetherill,G.D.(1965):Retainedplacentainthebovine.Abriefreview.CanadianVeterinaryJournal, 6: 290-294.
160. Yavas,Y.andWalton,J.S.(2000):Postpartumacyclicityinsuckledbeefcows:Areview.Theriogenology,54:25-55.
161. Yusuf, M., Nakao, T., Ranasinghe, R.B., Gautam, G., Long, S.T., Yoshida, C., Koike, K.and Hayashi, A. (2010): Reproductive performance of repeat breeders in dairyherds.Theriogenology, 73(9):1220-9.
162. Zaborski,D.,Grzesiak,W.,Szatkowska,I.,Dybus,A.,Muszynska,M.andJedrzejczak,
163. M.(2009):Factorsaffectingdystociaincattle.ReproductioninDomesticAnimals, 44: 540-551.
164. Zdunczyk, S., Mwaanga, E.S., Malecki-Tepicht, J., Baranski, W. and Janowski T. (2002):Plasma progesterone levels and clinical findings in dairy cows with post-partumanoestrus.Bulletin of theVeterinary Institutein Pulawy, 46: 79–86.