COLLEGE OF AGRICULTURE AND VETERINARY SCIENCES

FACULTY OF VETERINARY MEDICINE

Research project

TITLE: INVESTIGATION OF PREVALENCE OF INFERTILITY IN DAIRY CATTLE IN OTHAYA SUB COUNTY IN NYERI COUNTY.

This report is submitted to the University of Nairobi in partial fulfillment of the requirement for the award of Bachelor of Veterinary Medicine Degree.

DEPARTMENT: **Clinical Studies**

SUBMITTED BY: Maina Gabriel Wanjahi

REGISTRATION No: J30/2077/2010

SUPERVISOR: Dr.K. Mbai, (BVM, MSc.) LECTURER, DEPARTMENT OF CLINICAL STUDIES

TABLE OF CONTENTS

DECLARATION

I hereby, declare that the content of this report, "Prevalence of infertility in dairy cattle in Othaya Sub County, Nyeri County" are product of my own work and has not been presented for award of the degree in any other university.

Signature…………………………………

Date……………………

MAINA GABRIEL WANJAHI

J30/2077/2010.

This report has been submitted for examination with my approval as the University supervisor

Signature…………………………………

Date…………………………………………………….

DR. MBAI

Department of clinical Studies, University of Nairobi

Acknowledgements

Up and above all, all the glory to the Almighty God for His endless blessings.

I am greatly indebted to my Supervisor Dr. MBAI, department of clinical studies whose guidance and encouragement has been a source of inspiration and motivation throughout my work. I am really greatfull.

I also offer my humble thanks to my family for their financial support and encouragement throughout my research work.

Abstract

Agriculture plays a significant role in the Kenyan economy. Estimates have shown that 15% of the total farm revenue is generated from livestock products of which 3.5% comes from the dairy sector. The main products are milk and milk products, meat, skin and hides among others. . Reproductive management is the key determinant of production in the dairy industry. Repeat breeding as a major factor in reproductive inefficiency causes great economic losses to the farmers in terms of increased cost of insemination, reduced calf crop, extended intercalving interval, long lactation period resulting in decreased milk production, increased labour and treatment costs, increased cost of replacement and culling rates for animals that do not conceive. The aim of the study was therefore to establish the prevalence of repeat breeder syndrome in different breeds and reproductive ages of cattle. The study was carried out in Othaya sub county in Nyeri County. A total of 40 dairy cows were included in the research and were randomly selected in 8 randomly selected sublocations in Othaya constituency. Five animals were sampled in each sublocation. The study sample composed 32adultcows, 8 heifers, 25 Friesians, 13 arshyires and 2 Guernsey. Diagnosis of repeat breeding was made based on the number of inseminations per cow before conception. Animals with three or more services per conception were taken as repeat breeders. Out of 40 animals, 15 animals (37.5%) had the repeat breeder syndrome. Considering the breed, arshyires had the highest prevalence of repeat breeding (61.5%) followed by Friesians (28%). No case of repeat breeding was recorded in Guernseys as shown in table 3 According to this study, repeat breeder syndrome was found to be a significant cause of infertility in dairy cattle in Othaya Sub County.

Introduction

A repeat breeder is a cow that shows normal signs of estrous but return to heat repeatedly after being bred by a fertile bull (Roberts, 1971). Repeat breeders show no clinical abnormalities but require more than three inseminations before they conceive (Parkinson *et al*). Repeat breeding is a major cause of reproductive losses in dairy herds worldwide. It is a multifactorial disease and several etiological factors have been identified to cause the condition (Noakes *et al, 2001*). These include age, genetic abnormalities, endometritis, salpingitis, cervicitis, vaginitis, hormonal imbalances, ovulatory disorders, anatomical abnormalities of the reproductive tract, nutrition deficiencies, environmental factors such heat stress, infectious diseases, poor heat detection methods, poor record keeping, infertile bulls, poor timing and insemination techniques. Any of these disturbances may affect the interplay of oestrous behavior, hormonal patterns and ovarian dynamics, which in synchrony with uterine functions determines the outcome of mating or artificial insemination (Bage *et al., 2002).*Epidemiological studies of repeat breeder cow syndrome prevalence have shown disparate results ranging from 5% (Ayalon *et al.1984*) to 36% observed by Zambrano *et al (1982).*

Reproductiveinefficiency is major cause of economic losses in the dairy industry. The main reproductive objective of dairy farmers is to get one calf per cow per year. To achieve this objective, cows must be inseminated, conceive, carry pregnancy to term and wait to be inseminated again within 90 days post calving. Nevertheless, this is usually not attainable as many cows have to be inseminated for several consecutive times before conception.

Repeat breeding causes great economic losses to the farmers in terms of increased cost of insemination, reduced calf crop, extended intercalving interval, long lactation period resulting in decreased milk production, increased labour and treatment costs, increased cost of replacement and culling rates for animals that do not conceive. It is an economical to keep a non pregnant cow that should have been bred successfully bred (Roberts, 1971, Bennett, 1974).

Review of literature.

A repeat breeder is a cow that shows normal signs of estrous but return to heat repeatedly after being bred by a fertile bull. Repeat breeders show no clinical abnormalities but require more than three inseminations before they conceive (Parkinson *et al).* They can be grouped into two categories.

   a. Early repeaters
   b. Late repeaters

Early repeaters

Early repeaters come on heat within 18-24 days after insemination. These cows have their luteal function shorter than normal or typical for the physiological estrous cycle in non bred animals. In these cows the most probable event is fertilization failure as a result of factors such as delayed ovulation, poor semen quality, improper insemination techniques, poor timing and early embryonic death due to unfavorable uterine environment in cases of infections

Late repeaters

Late repeaters come on heat later than 25 days after insemination. These animals have their luteal function longer than the physiological luteal phase in non bred animals. Fertilization and initial

recognition of pregnancy in these animals probably takes place but pregnancy is lost due to factors such as inadequate luteal; insufficiency, inadequate embryo signaling, infectious diseases and induced luteolysis.

Etiological factors for repeat breeding.

Several factors have been suspected and can be grouped into the following.

> ➢ Anatomical abnormalities
>
> ➢ Endocrine imbalances
>
> ➢ Infectious conditions
>
> ➢ Management and nutrition factors

Anatomical abnormalities

These include hard and kinked cervix, Ovarobursal adhesions and uterine tumours. Ovarobursal adhesions result from rough and faulty handling of ovaries during gynecological examination, infusion of uterus using irritating drugs in large volumes and infectious conditions. Presences of these adhesions interfere with the movement of ovum and sperm leading to infertility. Unilateral or bilateral obstructions of fallopian tubes have also been described in repeat breeder syndrome. Acquired uterine alterations such as metritis are critical to resumption of normal cyclicity during postpartum period thus promoting repeat breeding *(Shresta et al., 2004)*

Hard and kinked cervix results from trauma and lacerations during parturition and artificial insemination. Trauma and lacerations of the cervix are followed by infection and fibrosis.

Vagina acts as a receptacle for semen and defensive barrier. Congenital anomalies, conformation defects (urovagina and pneumovagina) and infectious disorders alter vaginal pH and bacterial flora allowing infection and reducing the sperm vitality.

Uterine tumours such as in bovine leukosis usually result in reproductive failure

Endocrine factors

Transport of oocyte and zygote along the fallopian tubes is under hormonal influence particularly oestrogen and progesterone. Incorrect balance may retard or accelerate the movement of zygote so that it reaches the uterus when the environment is not conducive for its survival.

Luteal insufficiency.

Corpus luteum is the main source of progesterone in early pregnancy. The function of the corpus luteum is affected when it's not properly formed. Hypofunctional Cl causes a decrease in progesterone therefore forming inadequate uterine environment and this increases the abnormalities and embryo losses. Delayed increase in progesterone levels may indicate insufficient corpus luteum formation following ovulation or short luteal phase *(*Kimura *et al.,* 1987*).* Low progesterone levels have been shown to significantly reduce production of interferon –tau by bovine embryos.

Suprabasal progesterone levels around oestrous have been described in repeat breeders (Duchens *et al., 1995,* Bage *et al.,* 1997). It is associated with low Gonadotrophin levels and incomplete luteal regression after luteolysis which prolonged the follicular growth and damages the oocyte.

Follicular cysts

This condition is characterized by presence of thin walled fluid filled structures of about 25mm in diameter on ovarian surface. These structures persist on the ovarian surface for more than 7 days. Other signs include nymphomania, short inter-oestrous intervals, excessive heat behavior endocrine changes such as inadequate luteinizing hormone surge and increased levels of oestrogens. The condition is associated with negative energy balance and stress factor in high producing dairy cows. There is failure of positive feedback of follicular oestrogen on hypothalamus to release sufficient GnRH during oestrous to trigger the LH surge. This results in ovulation failure during oestrous.

Anovulation

This has been reported in 2-16% of repeat breeder cows. Anovulation is characterized by prolonged basal progesterone after oestrous (Gonzalez Stagnaro *et al.,* 1993, Perez Marin, 2007*).* The LH release pattern is altered and the follicle does not get the stimulus for ovulation to occur. The follicle continues to grow and release oestrogens which induce the formation of follicular cysts and causing delayed ovulation. Defective follicle recruitment during the middle and luteal phases has been suggested as a cause of anovulation. Irregular and delayed ovulations have been associated with asynchrony between oestrous and ovulation (Duchens *et al.,* 1994*),* asynchrony of LH peak and ovulation (Lee *et al.,* 1983*)* or incapacity of LH release (Duchen*s et al.,* 1995)

Influence on maternal age

Age impacts negatively on fertility (Hodel *et al,* 1995) and higher rates of repeat breeding have been described in old cows (Hewett 1968). Decreased fertility at old age is attributed to alterations in hypothalamic or pituitary hormonal levels or inability of the ovary to respond (Bullman and Lamming, 1978). Oocyte viability also decreases with increasing age (Lanman, 1968)

Genetic abnormalities

Genetic or chromosomal abnormalities can be inherited or occur during the differentiation process. These abnormalities have a negative effect on fertility. Repeat breeder syndrome has been described in cows with chromosomal abnormalities (Bruyas *et al., 1993*)

Nutritional deficiency

Quantitative and qualitative differences in the dairy ration cause reproductive dysfunctions (Roberts, 1971, Dovensky *et al., 1996*). Decrease in food intake, weight and body condition cause endocrine imbalances that affect fertility. Nutritional deficiency affect the postpartum period, causing delay in uterine involution.

Management

These are miscellaneous factors and include:

- ✓ Poor heat detection methods. The leads to insemination of the cows when they are not actually on heat.
- ✓ Poor record keeping

✓ Incorrect timing in relation to the onset of standing heat.

✓ Poor insemination techniques e.g. failure to observe hygiene and inadequate thawing

✓ Poor semen quality and improper handling of semen. Mistakes during semen handling have negative effects on semen quality.

Infectious causes of repeat breeding

Trichomoniasis

Trichomoniasis is a venereal disease of cattle characterized by infertilities, repeat breeder syndrome, abortions, pyometra and reduced calf crop. It is caused by a protozoan agent *Tritrichomonas fetus.* The disease is more prevalent where natural service is used. Transmission occurs through the venereal route from infected bull, infected semen and contaminated instrument such as vaginal speculum. Infected bulls are asymptomatic and remain carriers for life time. Transmission from bull to bull occurs during semen collection through contaminated artificial vagina. The organism resists cryopreservation and therefore present in semen. The organism inhabits the vaginal mucosa initially, and then ascends to involve the cervix and uterus where it causes purulent vaginitis and Endometritis. Fertilization takes place but usually results in early embryonic death and irregular return to heat. Abortions occur during the first trimester of gestation.

Bovine Genital Campylobacteriosis

Genital Campylobacteriosis is a venereal disease of cattle characterized by early embryonic death, infertility and abortions. The disease manifests as poor conception rates, increased return

to oestrous, permanent infertility and occasional abortions. The disease is caused by a gram-negative, curved or spiral, polar flagellated microaerophilic bacteria *Campylobacter fetusvenerealis* or *Campylobacter fetus fetus*. Transmission occurs venereally, through contaminated instruments, beddings and during artificial insemination using contaminated semen. Bulls become infected after mating infected cows and remain asymptomatic carriers of the disease. Campylobacter fetus fetus is not transmitted venereally and is not associated with infertilities. Infected cows do no show systemic signs of illness as the diseases only cause a localized infection in the uterus and fallopian tubes. The disease produce mucopurulent Endometritis that cause early embryonic death, prolonged luteal phase, increased return to oestrous which manifest as regular if embryonic death occurs before maternal recognition of pregnancy or irregular returns if embryonic death occurs after maternal recognition of pregnancy, usually after 25-35 days. Abortions occur between 4-7 months of gestation and aborted fetuses are characterized by necrotized and yellowish brown fetal cotyledons. Salpingitis may cause obstruction of fallopian tubes and this result in permanent infertility.

Infectious Bovine Rhinotracheitis

It is caused by a herpes virus. It causes conception failure, early embryonic death and abortion in late pregnancies.

Bovine Viral Diarrhea Virus

It is a viral disease that causes conception failure, early embryonic death and abortion in late pregnancy.

Neospora

Neospora is protozoa disease that affects cattle. It is transmitted by dogs and foxes. The disease causes fetal losses at any stage of gestation but losses are common in the second trimester of the pregnancy.

JUSTIFICATION

Dairy farming plays a considerable role in the life of the farmers in Nyeri County and also in other regions of the country as it provides milk, meat employment, and other products. Productivity in dairy industry comprises of milk production, value of off springs and individual market values. Reproductive management is the key determinant of production in the dairy industry. The main reproductive objective in dairy farming is to get one calf per year. This means that cows must get pregnant after service, maintain pregnancy to term and wait for 60-90 days to be successfully served again. This objective is not usually attained as most of the cows require to be inseminated for several consecutive times. Repeat breeding as a major factor in reproductive inefficiency causes great economic losses to the farmers in terms of increased cost of insemination, reduced calf crop, extended intercalving interval, long lactation period resulting in decreased milk production, increased labour and treatment costs, increased cost of replacement and culling rates for animals that do not conceive. This project is therefore justified as it will help in evaluation of significance of repeat breeding as a cause of reproductive losses in the dairy sector.

OBJECTIVES

General objectives

To determine the prevalence of infertility in dairy cattle in Nyeri county

Specific objectives

- ✓ To investigate the prevalence of repeat breeder syndrome in dairy cattle in Othaya county

- ✓ To determine age and breed prevalence of repeat breeding in dairy cattle

Materials and methods

The study area

The study was carried out in Othaya district in Nyeri County. Nyeri County is in the central part of Kenya and the main economic activity is agriculture. Majority of the people are coffee and tea growers in addition to dairy keeping.

Sample collection and sample size

The study was conducted in 8 randomly selected villages from which five farmers were selected randomly from each village. The selected villages were; Gaturuturu, Umbui, Gathumbi, Mucharage, Gathanji, Gachami, Karima and Kiambaru.

A total sample pool of 40 cows/and heifers were used in the study. Data collection was done by use of a questionnaire and the number of services per conception was recorded based on the data provided by the farmers.

Results and Data analysis

Table 1: Tabulation of the results.

Area of study	Sample No	Breed	Age	Breeding method	No of services per conception	Inter oestrous interval		
						<21 days	21 days	>21 days
Gaturuturu	1	Friesian	Adult	AI & Natural service	4			✓
	2	Friesian	Adult	AI	2		✓	
	3	Friesian	Adult	AI	2		✓	
	4	Friesian	Adult	AI	1		✓	
	5	Arshyire	Adult	AI	3			✓
Karima	1	Arshyire	Adult	AI	1		✓	
	2	Friesian	Adult	AI & natural service	4			✓
	3	Arshyire	Adult	Natural service	2		✓	
	4	Friesian	Heifer	AI & natural service	5			✓

	5	Arshyire	Adult	AI	4		✓	
Umbui	1	Friesian	Adult	AI	1		✓	
	2	Friesian	Heifer	Natural service	4			✓
	3	Friesian	Adult	AI	2		✓	
	4	Friesian	Heifer	AI	1		✓	
	5	Friesian	Adult	AI & Natural service	5	✓		
Gachami	1	Arshyire	Adult	AI & natural service	4			✓
	2	Friesian	Adult	AI	2		✓	
	3	Friesian	Adult	AI	1		✓	
	4	Guernsey	Adult	AI	1		✓	
	5	Friesian	Adult	AI & natural service	3	✓		
Gathanji	1	Arshyire	Heifer	AI	3		✓	
	2	Friesian	Adult	AI	1		✓	
	3	Friesian	Heifer	AI	3		✓	
	4	Friesian	Adult	AI	1		✓	
	5	Arshyire	Adult	AI	4	✓		

Kiambaru	1	Friesian	Adult	AI	1		✓	
	2	Arshyire	Adult	natural service	2			✓
	3	Arshyire	Adult	AI	4		✓	
	4	Friesian	Heifer	AI	1		✓	
	5	Friesian	Adult	AI	2		✓	
Gathumbi	1	Arshyire	Adult	AI	3	✓		
	2	Friesian	Adult	AI	2		✓	
	3	Friesian	Adult	AI	1		✓	
	4	Friesian	Adult	AI	2		✓	
	5	Guernsey	Adult	AI	2		✓	
Mucharage	1	Arshyire	Adult	AI	2		✓	
	2	Arshyire	Heifer	natural service	4	✓		
	3	Friesian	Adult	AI	1		✓	
	4	Friesian	Heifer	AI	1		✓	
	5	Arshyire	Adult	AI	2		✓	

Table 2: Prevalence of repeat breeding

Total no .of animals	**40**
No of animals with 3 or > 3 services per conception	**15**
Prevalence of repeat breeding (%)	**37.5**

Table 3: A table showing prevalence of repeat breeding in different breeds

Area of study	**Friesians**	**Arshyire**	**Guernsey**
Gaturuturu	4	1	-
Karima	2	3	-
Umbui	5	-	-
Gachami	3	1	1
Gathanji	3	2	-
Kiambaru	3	2	-
Gathumbi	3	1	1
Mucharage	2	3	-
TOTAL NO	**25**	**13**	**2**
No with 3 or more services per conception	**7**	**8**	**-**
Prevalence (%)	**28**	**61.5**	**-**

Table 4: A table showing prevalence of repeat breeding based on the method of breeding.

Area of study	Artificial insemination		Natural service		AI & natural service	
	No.	No . with 3 or more repeats	No.	No. with 3 or more repeats	No.	No. with 3 or more repeats
Gaturuturu	4	1	-	-	1	1
Karima	2	-	1	-	2	2
Umbui	3	-	1	1	1	1
Gachami	3	-	-	-	2	2
Gathanji	5	3	-	-	-	-
Kiambaru	4	1	1	-	-	-
Gathumbi	5	1	-	-	-	-
Mucharage	4	-	1	1	-	-
Total	30	6	4	2	6	6
Prevalence (%)		**20**		**50**		**100**

Table 5:   A table showing prevalence of repeat breeding in different ages of animals

Age	Total No of animals	No with 3 or more services per conception	Prevalence (%)
Adult	32	11	33.3
Heifers	8	4	50

Table 6: A table showing the percentage of animals with normal cycles based on the method of breeding.

Area of study	Artificial insemination			Natural service			AI & natural service		
	No.	No. with normal cycles	Percentage with normal cycles (%)	No.	No. with normal cycles	Percentage with normal cycles (%)	No.	No. with normal cycles	Percentage with normal (%)
Gaturuturu	4	3	75	-	-	-	1	-	-
Karima	2	2	100	1	1	100	2	-	-
Umbui	3	3	100	1	-	-	1	-	-
Gachami	3	3	100	-	-	-	2	1	50
Gathanji	5	4	80	-	-	-	-	-	-

Kiambaru	4	4	100	1	-	-	-	-	-
Gathumbi	5	4	80	-	-	-	-	-	-
Mucharage	4	4	100	1	-	-	-	-	-
Total	**30**	**27**	**90**	**4**	**1**	**25**	**6**	**1**	**16.7**

SUMMARY AND DISCUSION OF THE RESULTS

The total population sample of cows and heifers involved in the study was 40 animals. As presented in table 1, three breeds of cattle were involved in the study i.e. 25Friesians (62.5%), 13 arshyire (32.5%) and2Guernseys (0.05%). Out of the 40 animals, 32 were adults (80%) and 8 were heifers (20%).Artificial insemination and Natural service were the main methods of breeding used. Artificial insemination was used on 30 animals (75%), natural service in 4 animals (10%) and in 6 animals (15%) both AI and natural service was used. Out of the 40 animals, 28 animals came on heat after every 21 days, 5 animals came on heat in less than 21 days and 7 animals came on heat after more than 21 days. Animals with three or more services per conception were taken as repeat breeders. As shown in table 2, out of 40 animals, 15 animals (37.5%) had the repeat breeder syndrome. Considering the breed, arshyires had the highest prevalence of repeat breeding (61.5%) followed by Friesians (28%). No case of repeat breeding was recorded in Guernseys as shown in table 3. Table 4 shows that prevalence of repeat breeding was high in animals where both AI and natural service was used (100 %), in animals using AI the prevalence was 20% and 50% in animals bred by natural service. Considering the age of the animals, prevalence of repeat breeding was higher in heifers (50%) with multiparous animals having a prevalence of 33.3% as presented in table 5. All animals coming on heat every 21 days

were considered to have normal cycles. As shown in table 6, 90% had normal cycles in animals using AI, 25% on natural service and 16.7 % in animals using both AI and natural services

Conclusion

Based on this study, it can be concluded that repeat breeder syndrome is a significant cause of infertility in dairy cattle in Othaya sub county as represented in table 2. It is also evident that prevalence of repeat breeding is high in heifers compared to multiparous cows, arshyire breeds and in animals where both AI and natural services were used.

Recommendations

I would like to recommend the following.

- ✓ Have a veterinarian examine repeat breeder cows for causes of the same
- ✓ Where natural service is used, bulls should be tested for presence of infectious diseases before breeding. Bulls testing positive should not be used for breeding
- ✓ Farmers to maintain adequate reproductive records. Record all oestrous dates, examination dates and findings, unusual events such as difficult calving, retained placenta and treatments.

References

A Birds-Eye view of Veterinary Medicine

Arthurs Veterinary Reproduction and Obstetrics

Ayalon N the Repeat breeder problem proceeding 10th International congress. Animal Reproduction and AI Urbana.

Bage R. on repeat breeding on dairy heifers with specific focus on follicular dynamics, ovulation and oocyte qualities

Bailie JH. Management and economic effects of different levels of oestrous detection in dairy herd

Benjamins R. Repeat breeding or conception failure in cattle

Current therapy in Theriogenology.

Hewett CD a survey of incidence of repeat breeder cows in Sweden with reference to herd size, season, age and milk yield. British VET J 1968.342-352

H.GUstafsson.K Larson and MadejiA(1986).Sequential endocrine changes and behavior during oestrous and metestrous in repeat breeder heifer. Animal reproduction Sc (10) 1986 261-273.

The Merck's Veterinary Manuals

T.B GrohanErb and H. Saoloemi.Epidemiology of reproductive disorders in dairy cattle J.Prev.Med (8)1995.25-39.

M.Kimura. T.Nakao and K.Kawara.Luteal phase deficiency as a possible cause of repeat breeding in dairy cattle.Brtish Vet J (143) 1987. 560-566