

RECTAL PALPATION IN BOVINE FEMALE REPRODUCTION: ADVANTAGES, RISKS AND PROCEDURE. A REVIEW

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SUMMARY

Rectal palpation (palpation per rectum) is the most common technique used in bovine reproductive clinics. It is used for assessment of reproductive activity, diagnosis of pregnancy and detection of reproductive abnormalities. The technique is simple, relatively safe, inexpensive and popular. However, use requires adequate knowledge of applied reproductive anatomy and clinical endocrinology. In East Africa, such knowledge is usually provided by studies conducted elsewhere and limitations of the technique for indigenous cattle are not clearly defined. This review discusses advantages and risks associated with the technique while emphasizing the need of establishing data for indigenous breeds of Tanzania.

INTRODUCTION.

Rectal palpation is the most common technique used for examination of genital organs of cattle (Ball, 1980). The technique is relatively safe for both the operator and the animal, inexpensive, simple, accurate, and practical under a wide range of field conditions. Because of these attributes, the technique enjoys great popularity among veterinarians. Thus at present palpation per rectum is considered the method of choice for assessment of reproductive function, diagnosis of pregnancy and detection of reproductive abnormalities (Wischart *et al.*, 1975; Belling, 1986). The technique is also used in carrying out biotechnical procedures such as those of artificial insemination and embryo transfer (Oetzel *et al.*, 1987).

In order for someone to use the technique safely and accurately, there is great need for memorized learning and physical mastering of the technique. Mastery of the technique requires up-to-date knowledge of applied anatomy and information on clinical endocrinology as well as repeated practice for experience. In most veterinary schools and

colleges the technique is best taught by use of slaughter house facilities. In slaughter houses students learn how to palpate cows per rectum and in case of any damage the animals are slaughtered immediately. Slaughter houses also have another advantage in that findings obtained at first day of palpation can be compared with those obtained on the following day after the animals are slaughtered. Such an arrangement offers great advantage in that it enables students establish a mental and visual image of the most common uterine and ovarian findings. It also enables students develop mental-touch for the most common reproductive features, particularly size, position and consistency of the uterus and ovarian structures. Once the technique is mastered continuous practice is required in order to maintain the mental-touch. For most veterinarians, this "mental touch" is easily maintained by practicing in the field.

As adjunct to field experience, pictorial guides (atlases) illustrating variations of normal ovarian structures and uterine changes according to various stages of the reproductive

cycle are available (Belling, 1986; Bretzlaff, 1987). However, such guides are based on materials obtained from *Bos taurus* cattle only. There are no guides for *Bos indicus* (Zebu) cattle nor are there any for crosses between the zebu and *Bos taurus* (exotic) breeds. The use of *Bos taurus* guides for Tanzanian *Bos indicus* cattle or their crosses without critical re-evaluation may introduce elements of inaccuracy and pose difficulties in interpretation of findings. This is because there are clear indications that anatomical and endocrinological differences between *Bos taurus* and *Bos indicus* cattle are significant (Pathiraja *et al.*, 1986; Galina *et al.*, 1987). In general the reproductive tract of *Bos indicus* cattle is smaller than that of *Bos taurus* cattle. The need for establishing specific reproductive data for zebu and their crosses, and careful interpolation of information obtained elsewhere can therefore not be over emphasized.

This paper reviews in detail advantages, risks and sources of error associated with rectal palpation in Tanzanian zebus and their crossbreds. It also attempts to highlight dangers and consequences associated with absence of correct data. It is thus hoped that a foundation could be established on which rectal palpation in *Bos indicus* cattle could be practiced safely to the greatest benefit.

Advantages and risks of rectal palpation

Although the first detailed description of the technique for rectal palpation of genital organs of cows was given by Williams of the United States of America in 1924 and later by Nielsen of Denmark in 1938, the technique did not find wide applications until definite developments in herd health programmes and artificial insemination schemes became popular. Modifications and improvements of the original description of the technique continued to come by over the years (Rowson, 1942; Murraray, 1943; Koger, 1960; Zemjanis, 1970). This was made possible by several

studies conducted on the technique. Besides, there are some specific areas associated with rectal palpation which have intensively been studied. They include safety, accuracy and optimum time for employing the technique.

Safety of rectal palpation

Safety of the technique in both normo-cyclic and pregnant cows was one of the items that were intensively investigated by Lyons and Hackett (1970) and Abbitt *et al.* (1978). Lyons and Hackett investigated on the effect of repeated palpations per rectum of genital organs on fertility (Table 1). They showed that daily as well as weekly palpations of genital organs of forty normo-cyclic heifers during the entire oestrous cycle not affect oestrus cycle length nor fertility. Fertility was assessed by the number of services per conception. Earlier studies by Callahan (1969) in pregnant cows had reported that progress of gestation was unaffected by rectal palpation. This was, however, not confirmed by later research by Abbitt *et al.* (1978), Vaillancourt *et al.* (1979) and Franco *et al.* (1987). Abbitt and his group (1978) compared the effect of palpation per rectum of the genital organs during the early stages of pregnancy on conception and foetal loss. Three signs commonly used for detection of pregnancy were chosen and used as criteria for the comparison. These signs were the detection of fluctuation alone or both fluctuation and amniotic vesicle or both fluctuation and foetal membrane slip. The authors found out that foetal loss was lower in cows palpated per rectum first between Day 52 and Day 70 of pregnancy than in those examined between Day 35 and Day 51 of pregnancy (Table 2). For merit on individual signs used for detection of early pregnancy, use of fluctuation alone was found to be the safest. This was followed by detection of pregnancy through the detection of both fluctuation and amniotic vesicle.

Table 1: Effect of daily and weekly rectal palpation of genital organs on oestrous cycle length and conception of heifers

Frequency of palpation	No. of animals	Oestrous cycle length	Services per conception
Daily	20	22.1	1.4
Weekly	20	22.3	1.1

Source: Lyons and Hackett (1970)

Table 2: Effect of rectal palpation for various signs at different stages of pregnancy on apparent foetal loss

Sign of Pregnancy	Number palpated	Stage of pregnancy (Days)		Apparent loss (%)
		35 - 51	52 - 70	
Fluctuation(F)	140	4.3	136	1.7
F + Amniotic vesicle	206	7.8	117	1.7
F + Membrane slip	136	14.0	157	5.1
TOTAL	482	8.5	410	3 7

Source: Abbitt *et al.* (1978)

Detection of pregnancy through the detection of both of fluctuation and foetal membrane slip was the most risky.

In additional studies, regarding the effect of palpation per rectum of early pregnancy on foetal loss, a trend similar to that reported by Abbitt *et al.* (1978) was also observed by Vaillancourt *et al.* (1979) and Franco *et al.* (1987). In the study by Franco *et al.* (1987) 192 Holstein-Friesian cows were randomly

assigned into palpated and non palpated (control; 107 cows) groups. In the palpated group, animals were examined per rectum twice between Day 42 and 46 after insemination; whereas in the non palpated group no rectal palpations were carried out during the time of the study. At the end of the study (i.e. Day 90 after conception oestrus) both groups were rectally examined for pregnancy diagnosis. Palpation, done by two experienced clinicians, consisted of palpation

of foetal fluid fluctuation, identification of the amniotic vesicle and slipping of the chorioallantoic membranes. In both groups foetal viability was monitored at all times by determination of milk progesterone content. Samples were taken on days 0, 21 and 24 as well as twice weekly through to Day 63 (Day 0 = Day of oestrus and insemination). Radioimmunoassay in this case was only 80% accurate in determining pregnancy. The results showed that in the cows palpated on Days 42 to 46, pregnancy rates declined by 7.5% as determined by rectal palpation at Day 90 or by 11.4% as determined by milk progesterone at Day 63. Cows that were not palpated on Days 42 to 46 showed a 1.9% increase or 4.3% decline in pregnancy rates as determined by the same criteria (Table 3).

Reasons put forward to explain causes of foetal loss after palpation per rectum of early pregnancy have not been conclusive. However, the incidence of foetal loss may depend on intensity and degree of pressure applied on the genital organs at the time of palpation. Fluctuation detected by superficial pressing of a flat hand over the uterus gives a lower incidence of foetal loss than direct palpation of the amniotic vesicle (Ball and Carroll, 1963; Dawson, 1974). The amnion containing the foetus is protected by the amniotic fluid and the two form the amniotic vesicle. Therefore, detection of the amniotic vesicle must involve deep palpation of the genital organs. Indeed deep palpation of amniotic vesicle using the thumb on one side of the uterine horn and the four remaining fingers on the other side when done with undue pressure have been shown experimentally to terminate pregnancy. Death in this regard is a consequence of foetal heart rupture (Rowson and Dott, 1963; Dawson, 1974).

The foetal heart at early stages of pregnancy is not yet enclosed within the foetal body and appears to be very sensitive to slight pressure (Studer, 1969). Nevertheless careful palpation of amniotic vesicle is less damaging than palpation for foetal membrane slip. Palpation for foetal membrane slip employs a thumb on one side of the pregnant uterine horn and one or two fingers on the other (Figure 1). Pressure arising from such a procedure disrupts fragile blood vessels supplying the foetus. Thus such a procedure easily causes foetal loss.

Optimum time for pregnancy examination

Consideration of the above mentioned factors indicate that in order to reduce the risk of foetal loss, rectal palpation for pregnancy diagnosis is better done on a 56 day or older pregnancy. However, examination for pregnancy can not be delayed for that long. The economical and optimal time for rectal examination is around 40 days after service (BonDurrant, 1986; Mgongo, *et al.*, 1989). Early pregnancy diagnosis reduces the service period by timely exposing cows that should be rebred. In so doing it minimizes the costs resulting from maintaining non pregnant animals. The longer the pregnancy diagnosis is delayed the greater is the economic loss associated with loss of breeding time. In order to compromise between economical demands and embryo vulnerability, rectal palpation for fluctuation alone is recommended in cases where pregnancy examination is done earlier than 56 days. Fluctuation alone enables the operator to make "provisional" diagnosis of probably pregnant; and then confirmatory examination can be carried out at a much later date (White *et al.*, 1989).

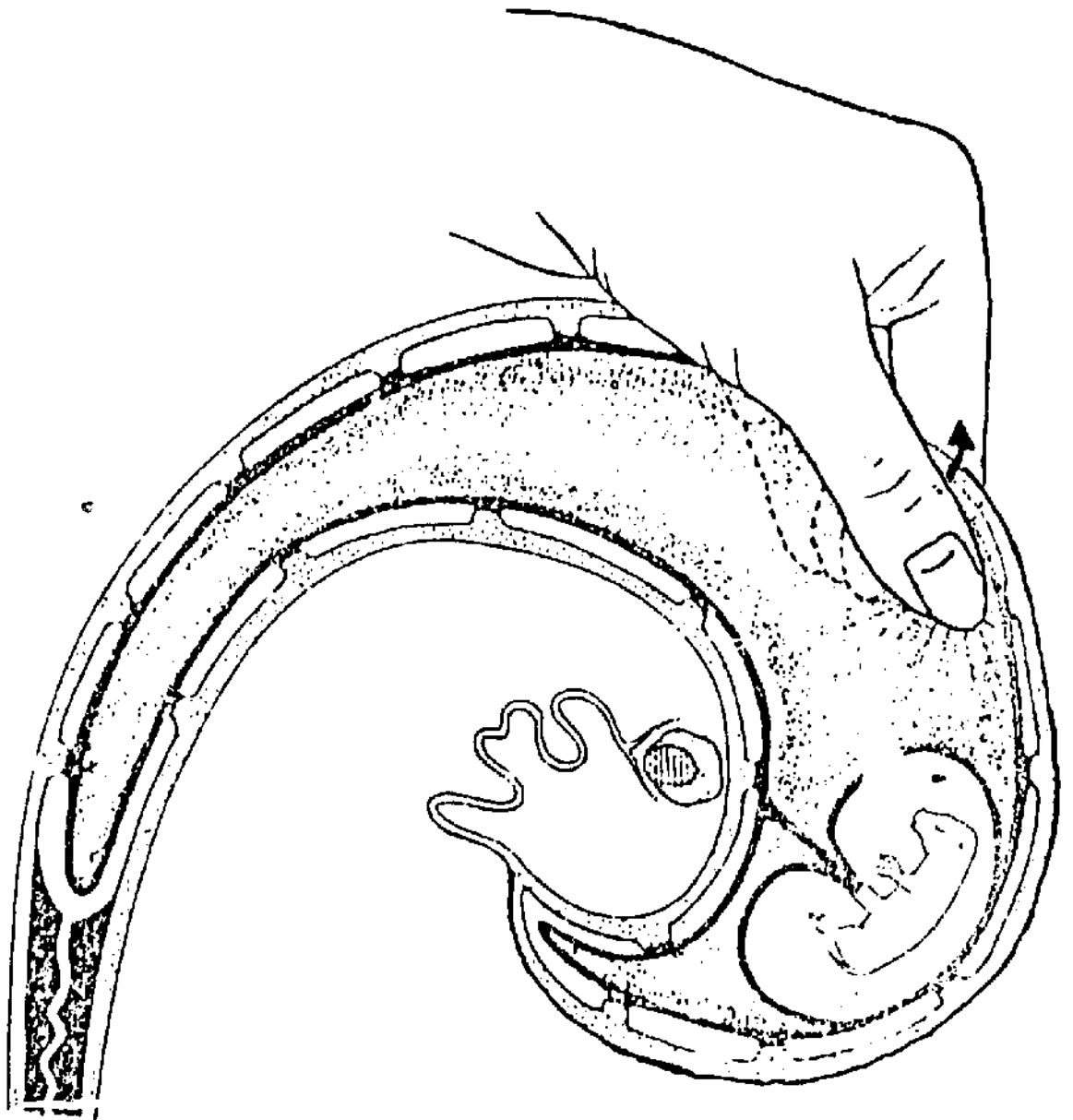


Figure 1. Palpation for foetal membrane slip employing the thumb and two fingers.

Table 3: Results of studies on effect of palpation of early pregnancy on foetal loss*

Day	G R O U P					
	Non palpated			Palpated		
	Animals ¹ (Total) n	Pregnant ² %		Animals (Total) n	Pregnant ² %	
01	107	-	-	85	-	-
20-24	107	107	100	85	85	100
25-42	107	78	72.9	85	74	87.1
43-46a	-	-	-	85	70	82.3
49-63	105	72	68.6	81	61	75.3
90a	107	80	74.8	85	66	77.6

Source: Franco *et al.* (1987).

* =Pregnancy was monitored by milk progesterone assay in both groups.

a =Pregnancy was established by rectal palpation.

¹ =Represents total no. of experimental cows in the group

² =Denotes number and percent of animals pregnant.

43-46a= Data for non palpated group was not available because diagnosis at this time was by rectal palpation.

Practicability of rectal palpation

Practicability of the technique to field conditions is an advantage which has made rectal palpation popular among users. The technique is considered to be practicable in all day to day gynaecological work in the field because it requires inexpensive equipment and that it is always accessible to farmers as well as veterinarians. Moreover, results of rectal palpation are available immediately after the procedure. This facilitates prompt decisions to be made on the animals examined. For example, infertile cows can be culled before they eat farm profits. Rectal palpation also helps to avoid selling pregnant cows at cheaper prices

meant for empty ones (Koger, 1960;). The reverse is also true when animals are empty but sold as pregnant.

Accuracy of the technique

Accuracy of the technique of rectal palpation has been investigated by a number of authors (Murray, 1959; Dawson, 1975; Pathiraja *et al.*, 1986; LLewelyn *et al.*, 1987). Accuracy has been found to be subjective and mostly governed by structures and conditions being investigated, type of animals and experience of veterinarian. For example, accuracy for diagnosis of uterine and ovarian bursal conditions was found to be over 97 % or same as accuracy observed at postmortem

Table 4: Accuracy of rectal palpation in diagnosis of corpus luteum (CL)

No of cows examined	Per cent accuracy in detecting a C L		
	presence	Absence	Reference
10	61	98	LLewelyn <i>et al.</i> , 1987
75	77	-	Pathiraja <i>et al.</i> , 1986
85	67	98	Dawson, 1975
97	89	60	Landsverk & Karlberg, 1987

Table 5: Accuracy of rectal palpation in diagnosis of ovarian function

Diagnosis	Number examined	Accurate Diagnosis	Percent accurate
Proestrus	24	13	54.2
Oestrus	10	6	60.0
Metoestrus	42	30	71.4
Dioestrus	108	97	89.8
TOTAL	146	184	79.3

Source: Landsverk and Karlberg, 1987

examinations (Murray, 1959). However, when dairy cows were examined for ovarian structures (i.e. corpora lutea, follicles and cysts), an accuracy of about 75% was obtained (Dawson, 1975). Similar results were also reported by several other authors (Boyd and Munro, 1979; Landsverk and Karlberg, 1987; Pathiraja *et al.*, 1986). More findings from research on accuracy of rectal palpation are presented in Table 4 and Table 5.

Reduced accuracy of the technique is mainly due to large variations in size and shape of ovaries. The variations in size and shape are

themselves influenced by breed, age, stage of reproductive cycle, level of feeding and environment. For example, zebu cows have oval or round ovaries with a mean length and a width of about 2.8 and 1.5 cm, respectively or an average diameter of 2.1 cm (Lamorde and Kumar, 1978); whereas *Bos taurus* breeds have oval ovaries, flattened on both sides with length, width and height of 4.0, 3.2 and 2.4 cm, respectively (Gould *et al.*, 1942; Galina *et al.*, 1987). Furthermore, corpora lutea of *Bos taurus* cattle are distinct measuring 2.5 to 3.5 cm when fully developed. Those of

Bos indicus breeds on the other hand, reach only half of this size and the majority do not rise significantly above the surface of the ovary; thus they are less distinct (Galina *et al.*, 1987). The small size of ovaries and ovarian structures for cows raised in the tropics is thought to be due to effect of environment (Dobson and Kamonpatana, 1986).

The influence of stage of reproductive cycle on size as well as consistency of the corpus luteum is well known (Arthur *et al.*, 1986). Corpora lutea formed after first postpartum ovulation are relatively small: those developing or regressing after normal oestrous cyclicity are also small (Duby *et al.* 1985; BonDurrant, 1986). Consistency of developing corpora lutea is generally soft whereas that of regressing ones is firm-almost hard. Level of feeding has an influence on ovarian structures because it determines oestrous cyclicity and consequently presence of ovarian structures. Poorly fed animals may have ovarian inactivity with neither follicle nor corpus luteum.

The presence of a corpus luteum changes the size and shape of the ovary. However, morphological changes in ovaries of zebu cattle are not dramatic, reflecting that ovarian hormonal activity is less intense than that of *Bos taurus* cattle. On the other hand the influence of follicle on the size of the ovary is, like in Taurine cattle, negligible. Follicles are smooth fluctuant structures blending evenly into the ovary without significant change in shape or size of the ovary (Table 6).

From the above information and in view of large variations in size and shape of ovaries, it can be concluded that the use of these parameters (size and shape) as means of assessing the reproductive activity in zebu cows is less meaningful. However, detection of ovarian structures namely a follicle and/or

corpus luteum should be the key indicators of reproductive status. Palpable characteristics of these structures in terms of consistency, mobility and time of occurrence in the zebu are the same as those in taurine cattle. This means that guidelines designed for taurine cattle can be used with the same achievement in Zebu. Most important is that structures in the right ovary should be compared with those of the left side. The major source of error in the diagnosis of the stage of oestrous cycle when using the follicle and corpus luteum is associated with variations in follicular activity. It is known that there are more than three waves of follicular growth in one oestrous cycle (Thatcher *et al.*, 1989; Carrol *et al.*, 1990). Follicles of each wave grow to size nearing that of mature follicle. There are times therefore, particularly between Day 6-8 and Day 14-16 of the oestrous cycle when large follicles occur in the presence of a corpus luteum of dioestrus and can easily be misinterpreted as proestrus.

Risks associated with rectal palpation

Apart from the problem of accuracy, rectal palpation is associated with few other risks. These include accidental perforation of the rectal wall, rupture of follicles and enucleation of corpus luteum. Rupture of follicles at oestrus is usually associated with poor conception rates and enucleation of corpus luteum may be associated with excessive haemorrhage and sometimes death.

Rectal examination involves handling of living tissue which is easily damaged. If someone wishes to examine the ovaries, palpate follicles and corpus luteum in order to determine the stage of the oestrous cycle, rectal palpation should be done in a gentle, skillful manner. The accidental rupture of follicles results in prolongation of the

oestrous cycle length and disruption of oestrous cyclicity. Accidental or planned enucleation of the corpus luteum and/or rupture of follicles have been associated with excessive bleeding. In reality, however, the incidence of excessive bleeding is very low and dangers associated with it are usually an over exaggeration. Literature shows that out of 1000 to 3000 enucleations of corpora lutea only one results in death of the animal (Stolla and Himmer, 1980). However, non-life threatening events associated with enucleation of corpus luteum or rupture of ovarian follicles are important, with the occurrence of periovarian adhesions being the most common. Experimental evidence has shown that up to 39 % of cows succumb to ovarian adhesions and undergo some form of inflammation of structures around the ovary after the enucleation (Roberts, 1986). Although the uterine (fallopian) tubes might not be blocked or occluded, endosalpingitis always supervenes and result in a severe reduction of fertility. Our experiences with Zebu cattle is that ovarian adhesions are common after prolonged palpation of ovaries. In our opinion the incidence seems to be much higher than that for taurine breeds. From this it can be suggested that much more care is required when examining ovarian structures of Zebu cattle than for taurine cattle.

Requirements

Prerequisite requirements for rectal palpation include simple equipment, restraint and systematic procedure. Equipment for rectal palpation include first and foremost, a hand. A hand is considered to be the most important single equipment used in rectal palpation. This is because the hand can palpate the organs easily without injury, feel and adopt to shape of structures being palpated, perceive resistance and give an idea of force to be applied. It has, however, to be without rings especially those with

settings, and without long nails.

Waterproof clothing that is easy to clean is the second component under equipment. It consists of rubber boots, rubber or plastic apron and arm long obstetrical sleeve with or without an attached rubber glove. These items are meant to protect the operator from dirt especially faeces and odour. The items are easily available in the market and are supplied in different sizes.

It is essential that right sizes of equipment be used for rectal palpation. If for example, a tight sleeve is used it may impede circulation to the point where ease, sensitivity and reliability of examination is interfered with. Likewise too small gloves compress fingers and make examination uncomfortable and impossible. On the other hand, too large gloves may make folds that interfere with examination by adding more barriers between fingers and organs being palpated. Plastic sleeves are sometimes used as substitutes for rubber sleeve. But these, especially the ones with sharp sealed edges nick and lacerate rectal mucosa and anal skin. They are good for brief rectal examinations such as that done at artificial insemination, but are not suitable for protracted examinations. Various modifications can, however, be made in arm long sleeves in order to avoid the mentioned disadvantages. Plastic sleeves, for example, are as suitable as rubber sleeves when combined with latex rubber gloves. The latter is, in this case, applied over the plastic sleeves after removing the tips of their fingers (Roberts, 1986). Latex rubber gloves used for sterile operation can be reused for rectal palpation.

Restraint in a suitable place is another requirement. It helps to avoid injury to the cow, operator or assistant. There is no rule governing the extent of restraint. Some cows need elaborate restraint while others need

almost none. In fact some animals are more difficult to handle when restrained. Therefore, depending on temperament of the animal any facility that prevent forward or lateral motion is considered to be adequate. In general, however, restraint in a chute is advisable for beef cattle and most of *Bos indicus* breeds whereas in most dairy cows a stanchion or halter is adequate. In our practice we have found out that the anti-kicking devise especially one demonstrated in Figure 2 is extremely useful in the zebu.

examination and in recording findings cannot be overemphasized. Systematic procedure ensures that no structure or part of genital tract is overlooked and that no information is left unrecorded. Detailed examination procedure includes components of history, general inspection and rectal examination itself.

History taking is, usually, taken informally while the animal is being examined. History furnishes the operator with information on



Figure 2. The anti-kick devise

Tranquilization can also be used but is relatively expensive. Regarding suitability of the place, one must always avoid smooth floors as these may cause slipping of the animal or operator.

The need for systematic procedure in

age, parity, dates of calving, heats, services, pathological events and management (feeding and housing) practices. The only reliable source of such data is reproductive records on correctly identified animals. All in all information given by farmers can only be

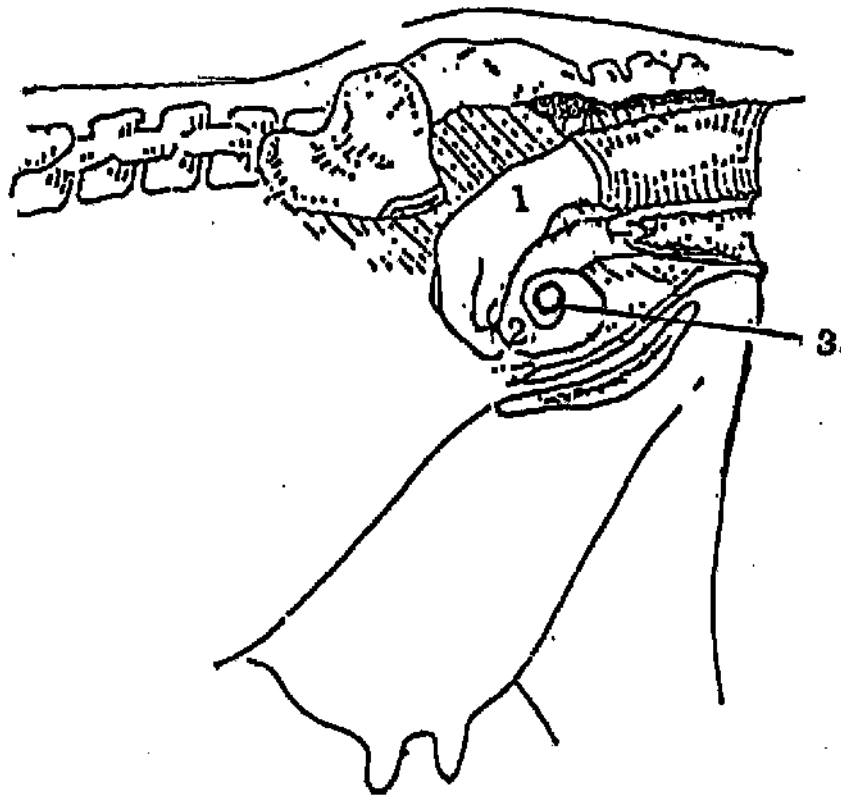
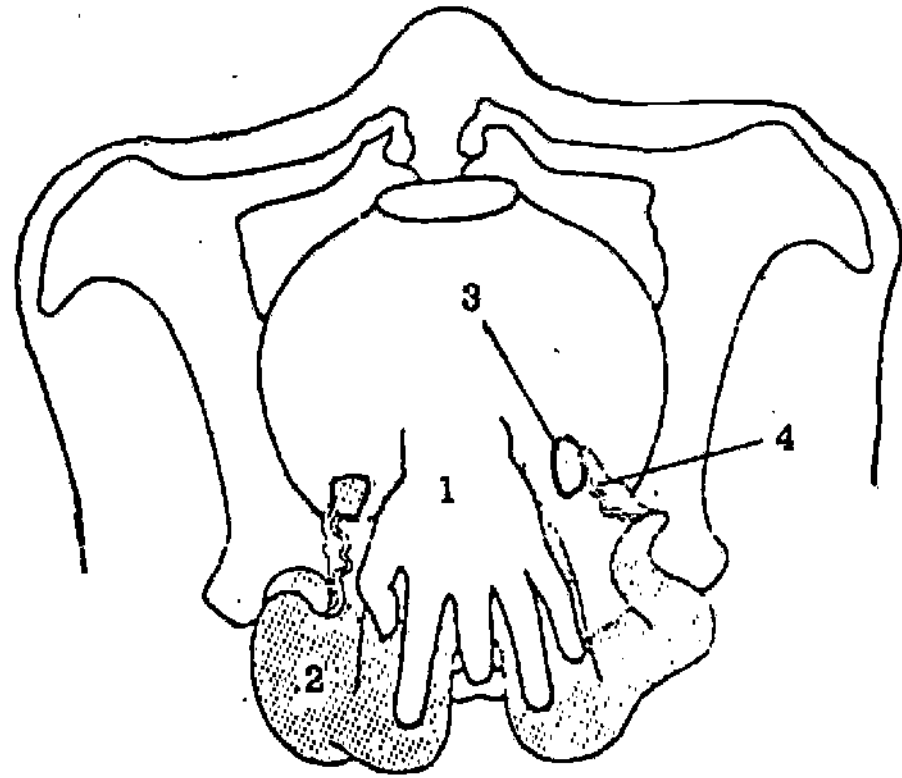


Figure 3. Palpation of genital organs in a cow cranial and lateral view (1, hand in the rectum; 2, uterus; 3, Ovary; 4, fallopian tubes).

used as guide.

The value of general inspection, as part of rectal palpation, is sometimes questioned because of hidden location of genital organs. But this component is indispensable. It gives the operator some clues about the state of reproductive organs and helps to avoid obvious mistakes. For example, masculine appearance in a cow is indicative of ovarian cyst, steer like appearance of a heifer may be due to ovarian hypoplasia, whereas loss of condition may be associated with ovarian inactivity. Furthermore, general inspection ensures that one will not diagnose pregnancy in a castrated bull.

The actual examination consist essentially of physical palpation per rectum of the cervix, uterus, ovaries, ovarian bursae and other supporting structures.

In situ the structures in non pregnant cows appear as shown in Figure 3.

Procedure of rectal palpation

Application of a water soluble non irritating lubricant on a gloved arm is the first step in rectal palpation. The lubricant is more effective if applied on the backside of the arm because that is the side which causes greatest friction with the animal tissues.

The second step is shaping of a hand into a form of a cone; and its insertion into the rectum. To accomplish this step a manoeuvre to overcome resistance of anal sphincter is required. This involves applying the lubricant on the peripheral aspect of the anus and a gentle force while twisting a hand through a semicircle. As a rule entry into the rectum provokes defaecation reflex. This reflex can be taken advantage of for evacuation of faeces. In this respect, the hand can be allowed to be forced out of the rectum, together with faeces, by peristaltic

waves. Further removal of faecal material from the rectum is done by raking it with a hand, palm uppermost. Frequent removal of the hand from the rectum may, due to negative pressure existing in the abdomen, result in aspiration of air and consequently distend the rectal wall (balloon the rectum). Ballooning can, in extreme cases, render the rectal wall stiff and unyielding. Attempts to palpate the genital organs in such circumstances are unrewarding and may only damage the rectal wall. Therefore removal of the hand should be done once or twice. If despite this precaution, ballooning does occur, massaging the rectal wall just anterior to the anus or hooking the most posterior peristaltic fold and moving with it gently backwards is advised. Either of the two manoeuvre may stimulate peristaltic waves with expulsion of air. After evacuation of faeces and/or air the hand is again reinserted and advanced as far as possible in the direction of a relaxed rectum until the circular fold indicating the anterior boundary of ampulla recti is located. The hand is then placed in such a way that the circular fold comes to lie between the thumb and other four fingers. Such a procedure reduces hindrance of peristaltic waves that are exceptionally prominent in this region. The procedure also produces greater relaxation of the rectal wall and gives more freedom to the hand.

Genital organs are not directly palpated during rectal examination. There are four barriers between the hand and the organs, namely: glove, rectal wall, abdominal space and uterine wall. Furthermore, there are some visceral structures that may be confused with genital organs. Therefore, without general orientation using appropriate landmarks, one may not know what he is palpating. Landmarks for general orientation include pelvic brim, shaft of ilium and the cervix. The pelvic brim and the shaft of ilium because of their central location and

solid nature are the first two landmarks to be located. Once located, the palm of the hand with fingers slightly bent is swept on the pelvic brim from the shaft of ilium on one side, downwards and then upwards on the other side. Usually the cervix, the second landmark, is found on the pelvic brim. It is a firm cylindrical and somewhat nodular structure, that gives a sensation of palpating a ringed organ. In non pregnant cows it is mobile and can be grasped and moved from side to side. If this organ is not felt between the rectal wall and the pelvic brim, then probably the genital organs are in the pelvic cavity in which case the procedure of sweeping the hand from one side of pelvic cavity to the other is repeated at various depths until the cervix is located. Alternatively the palm of the hand can be drawn blindly backwards until the curled uterus is encountered within the pelvic cavity (Koger, 1960; Belling, 1964).

The uterus is palpated as a continuation of the cervix. Uterine horns are felt as two parallel tubular structures curving initially downward and forward, then after forming a greater curvature, they pass backward and upward such that they come to lie 5-6 cm from the cervix. Detection of a depression between two conjoined horns is a positive evidence that it is the uterus that is being palpated. This evidence must always be looked for in order to differentiate the uterus from intestine. The features mentioned here can, however, be modified or changed by manoeuvre employed during rectal palpation, and by reproductive status of the cow at the time of examination. For example, in pregnant cows and in non pregnant multiparous ones, the greater part of the uterus may be located in the abdomen. For proper examination to be carried out retraction in such animals is indicated provided pregnancy is not more than three months. Retraction has a purpose of bringing the genital organs within the reach of a hand

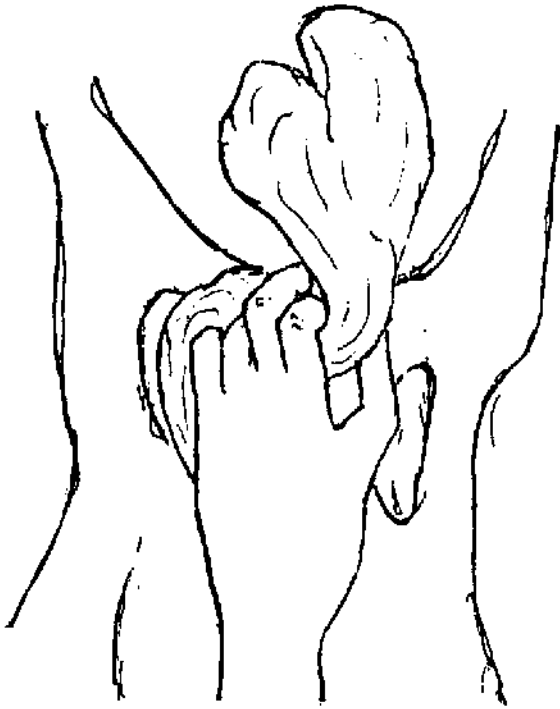
so that palpation can be done comfortably. Methods of retraction are several; all aim at achieving complete retraction without lodging the uterus beneath the broad ligament, where it becomes impossible to palpate. One of the methods, recommended by Ball (1980), is apparently the simplest for beginners and is illustrated in Figure 4. It involves grasping the cranial portion of the cervix and retracting it while exerting leverage against it. This makes its cranial end to become elevated against the side of the pelvis and as such the whole reproductive tract assumes a reversed S configuration. Insertion of thumb under the upper curve of the S and extension of fingers around the left horn in case the left hand is being used is the next step. From this location the left horn can be palpated.

After palpation of the left horn fingers are placed under the intercornual ligament and horns tilted ventrally and backward for easy access of the right horn. Then the thumb is inserted between the horns to maintain retraction while the second horn is being palpated.

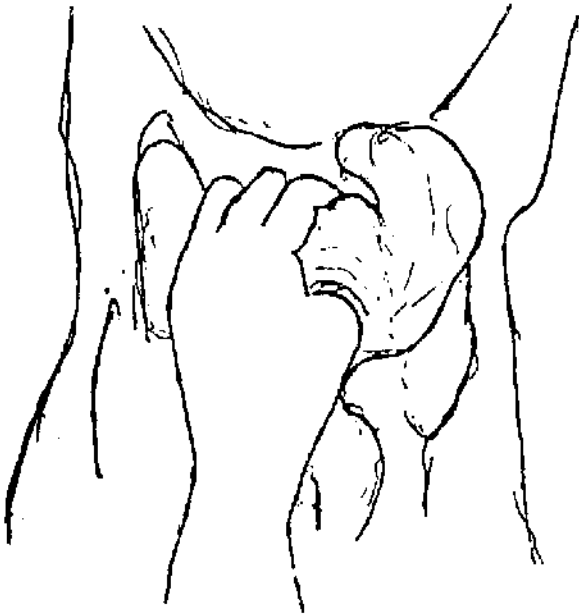
Ovaries are routinely examined in all non pregnant cows. They are found cranially and laterally to the cervix on the floor of the pelvis. A common mistake is that of trying to locate them too high on the side of the pelvic wall or too far cranially. They are best located by sweeping the entire tract to one side, pressing the fingers flat wise into the bowel in the opposite side, just anterior to the cervix, and stroking backwards.

In this way the ovary is felt on each side as a nodular projection suspended in broad ligament. The ovary can be grasped, placed between the middle and ring finger and systematic palpation can be accomplished by the thumb and index finger.

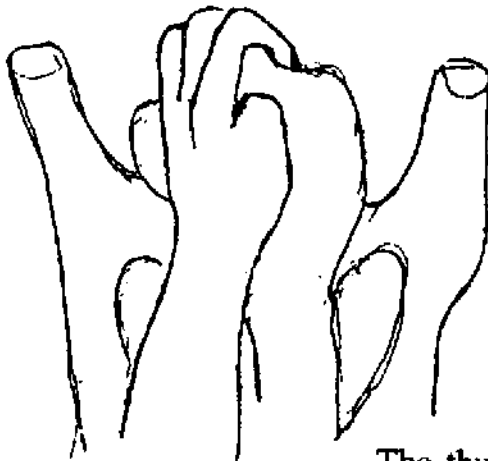
At rectal palpation bovine genital organs may be found in any of four stages of oestrous cycle or may be found at any stage of gestation.



The cranial portion of the cervix is grasped and retracted so that it forms a reversed S configuration.



The thumb is inserted under the upper curve of the S and fingers are then extended around the left horn for palpation.



The thumb is inserted between the horns to maintain retraction and the second horn palpated.

Figure 4. Retraction of the uterus

Table 6. Palpable characteristics of ovarian structures according to reproductive status

Structure	Characteristics	Stage/occurrence
Follicle	Smooth, hard blending smoothly with ovarian stroma	Always present
Oestrus follicle	Large, 2.0-2.5 cm, smooth, soft, fluctuating, with varied prominence	Oestrus
Growing corpus luteum	< ½ the size of ovary border with rest of the ovary not clearly distinct	1 to 7 days after oestrus
Mature corpus luteum	> ½ the size of ovary rubber like consistency Clear border with the rest of ovary	8 to 15 days after oestrus
Regressing corpus luteum	< ½ the size of ovary hard, clearly demarcated from the rest of the ovary	16 to 20 days after oestrus
Old corpus luteum	Small, almost solid only the prominent part palpable	After day 21 postpartum
Corpus luteum of pregnancy	> ½ the size of ovary, border with ovary is less prominent	Pregnancy
Ovarian cysts	Diameter > 2.5 cm smooth, fluctuating with thin or, thick persisting for more than 10 days	Occur any time even during pregnancy

Source: Zemjanis, 1970; Grunert and Berchtold, 1982; Arthur *et al.*, 1986; Morrow, 1986; Roberts, 1986

Table 7. Expected changes of the uterus at rectal examination of a cow

Criteria	Normal	Change	Reason/Diagnosis
Ligamentum sacrotuberalis lata	tense	relaxed	approaching parturition, ovarian cyst
Fossa ischiorectalis	full	empty or positioned more	old age, urovagina, malnutrition, calving injuries.
Perineum and surroundings	clean	secretions and discharge Blood discharge	oestrus, nearing parturition, endometritis. metoestrus
Vulva	small, pale with many folds	enlarged, congested and oedematous	oestrus, nearing parturition, ovarian cysts, inflammation
Closure of vulva	good	Insufficient	calving injuries, old age, prolapse of the vagina
Position of the vulval commissure	perpendicular	oblique	urovagina, Birth injury, torsion of uterus
Hair at commissure	clean	with secretion mucus or pus puerperium.	oestrus, endometritis,

NB: Vaginal discharge or unclear mucus does not always reflect endometritis, Normal pregnant cows can discharge dirty mucus.

Table 8. Expected changes of the uterus at rectal examination of a cow

Criteria	Normal	Change	Reason/Diagnosis
Position	Intrapelvic	Intra-abdominal	old age, pregnancy, puerperium
Size	1-2 fingers can be collected under the palm	larger than 3 but collectable	old age, postpartum, early pregnancy.
		Not collectable	Pregnant, pathological or, early puerperium
Symmetry	symmetrical	Asymmetrical (one horn more that twice as large as the other)	Pregnancy, Puerperium
Consistency	Average	Very strong	oestrus
Tonus		Hard/firm ridge like Very thin walls Fleshy and flaccid	Early puerperium Pregnancy, old age, inactive ovaries, ovarian cysts
Contractility	small	Strong Absent	Oestrus Old age, inactive ovaries adhesions
Content	Not detectable	fluid like	pyometra, mucometra or Lochiometra, early pregnancy
		foetal parts	Pregnancy, Mummification.
Movement	Free	Reduced/ Restricted	Pregnancy, Early puerperium, adhesions.

Table 9 Palpable and other characteristics of common reproductive abnormalities in the cow.

	uterus	ovaries	others
Metritis	Atonic, enlarged, warm and not asymmetrical	inactive: ovarian structures not detectable.	foetid vaginal discharge, dilated cervix.
Endometritis		Normal cyclicity	mucus cloudy with flakes of pus at oestrus.
Pyometra	fluid in the lumen	persistent corpus luteum	foetid, mucopurulent material discharged intermittently from vagina.
Foetal mummification	foetus tightly bound by uterus, palpation of bones, absence of fluid, placentoms absent	persistent corpus luteum	absence of fremitus
Foetal maceration	enlarged, non retractable	absence of corpus luteum	absence of fremitus chronic purulent discharge
Dropsy of foetal membranes	distended, dome shaped, may fill the whole space of posterior abdomen.		depression sluggishness, dyspnoea, enlargement of the abdomen.
Ovarian cysts	atonic uterus	one or more sometimes with follicles on one or both ovaries with size >2.5 cm	relaxation of pelvic ligaments anovulatory
Ovarian inactivity	small, fleshy atonic	small, smooth inactive	

There are many reproductive abnormalities that can also be detected by this method. Methods for detection of these conditions are adequately covered in recent reviews (Settergren, 1980; Morrow, 1986; Roberts, 1986; Arthur et al 1989). A summary of findings at rectal palpation in genital organs of non pregnant cows according to stage of oestrous cycle, those of pregnant cows according to stage of gestation, and common reproductive abnormalities are given in Tables 6 to 9.

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