The Dropped Ovary Technique for Spaying Cattle

A Training Manual
The Dropped Ovary Technique for Spaying Cattle – A Training Manual

Australian Cattle Veterinarians
A Special Interest Group of the Australian Veterinary Association
Welcome to the Australian Cattle Veterinarians (ACV) Publication on ‘Dropped Ovary Technique for Spaying Cattle – A Training Manual’. The ACV thanks Meat and Livestock Australia (MLA) for their funding assistance for this project.

The Dropped Ovary Technique for Spaying Cattle procedure is commonly known as the Willis Spay Technique. The Willis Spay technique is a recognized procedure for controlling fertility in females in extensive beef herds. An important advantage of the Willis technique is that it is superior to flank and passage spaying in terms of animal welfare and hygiene.

Cows and heifers that have undergone the procedure can be combined with the general herd on extensive properties and will gain live weight rather than becoming pregnant, thus increasing the annual turnoff and helping to reduce mortalities.

Australian Cattle Veterinarians has developed this training manual with the aim of recommending the Dropped Ovary Technique as the preferred surgical procedure for controlling fertility in beef cattle, and encouraging operators to be appropriately trained in the process.

Australian Cattle Veterinarians are obviously strong supporters of the beef industry and are constantly seeking production systems, medical intervention and surgical procedures that improve animal welfare and profitability for our animal and human clients. The Dropped Ovary Technique for Spaying Cattle fits into this objective so we hope all readers benefit from this manual.

Dr Sandi Jephcott

President Australian Cattle Veterinarians
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Introduction

Surgical removal of the ovaries (ovariectomy, spaying) is used in extensive beef cattle herds in northern Australia where it has an important role in increasing survival and turn-off value of female cattle. Dr Charles Willis, a veterinarian in the USA, promoted the Dropped-Ovary Technique (DOT) for ovariectomy in the early 1980's. The technique has been promoted in Australia since 1997 due to the continued need to control pregnancy in cattle and the desire for a more humane and less traumatic technique than the traditional flank approach (Appendix 6). With this method of spaying, the hide is not damaged, and there is no carcase trim. Required restraint is minimal and not more than is usually necessary for pregnancy diagnosis or artificial insemination. The technique requires the operator to have good ovarian palpation skills. In the hands of an experienced operator it offers high processing rates with minimal surgical complications and it is a humane and aesthetically acceptable means of spaying.

Spaying of cattle is an act of veterinary science but lay spaying is allowed to continue due to the geographic circumstances in the NT. Spaying of cattle by lay operators for profit is permitted in the Northern Territory by a Chief Inspector exemption under the Veterinarians Act. Lay operators are advised to check the legal situation in the state in which they might operate before they spay. At all times the spay technician must consider the welfare of the animal being operated upon and act appropriately.

Reasons for ovariectomy

The control of fertile males in the extensively managed beef herds is difficult, resulting in unwanted conceptions.

Ovariectomy used for pregnancy prevention is an important way for guaranteeing survival and value adding to cull female stock. Ovariectomy removes the demands of pregnancy and lactation and has contributed significantly to reducing female death rates, increasing female turn off and improved enterprise profitability for north Australian beef cattle properties.

Compared to steers, both intact and spayed heifers have reduced growth rates and convert feed less efficiently. This can be overcome to some extent by the use of hormonal growth promotants. However, there is a considerable cultural bias against intact heifers for the live export feeder trade to south-east Asia, to the extent that they comprise less than 5% of the trade. This is due to the perception that they disturb other cattle when in oestrus, and they may become pregnant.

Alternatives to ovariectomy

Technicians and veterinarians should be aware that there are sometimes options for the management of cull heifers and cows other than spaying. These may involve feedlotting, alternate selling options, breeder segregation, heifer-safe paddocks, bull removal, pregnancy diagnosis of live export heifers by accredited testers, or the use of prostaglandins for heifers that are early (less than 100 days) pregnant prior to transport to a feedlot. It is important owners are allowed to make an informed decision on the management of their stock.

General management considerations when selecting cattle for ovariectomy

The animals to consider for spaying using the DOT are surplus lactating cows and heifers. The surplus dry cows are usually already in marketable condition and do not need to be ovariectomised. The lactating cows may or may not have had their calf removed. In any case
they will be in light condition and either empty or early pregnant. Brahman and Brahman cross heifers will mostly be empty or early pregnant if under 300 kg live weight. These cows and heifers can be ovariectomised and returned to their paddock. Those ovariectomised cows with an unweaned calf at foot will continue to lose considerable body condition if they are lactating during the dry season and will need to be weaned in the ensuing months. As a result of ovariectomy, they will not conceive again and once weaned, will fatten (+ 100 kg) over the following wet season and be ready for sale early the following dry season. Those that have had their calf removed will not lose as much condition in the dry season but will require the wet season to fatten. They should be in excellent sale condition (+150 kg) in the following early dry season.

**Selection and management of cattle for ovariectomy using the DOT**

Proper selection and management of cattle for ovariectomy is important to minimise complications and mortalities. It is important that cattle managers own this responsibility, not just the person performing the operation. It is recommended that guidelines similar to those provided in Appendix 5 are provided to cattle managers intending to use this method of pregnancy control.

**Animal Size**

Minimum size of animals depends on the size of the operators hand and forearm relative to the size of the animal’s anus and rectum. *Bos indicus* cattle tend to be softer and slacker in the pelvic ligaments compared to *Bos taurus* cattle and hence tend to be better candidates for this procedure at a similar weight and size. Generally a 180 kg live weight lower limit is a reasonable criterion but in practice if the hand can fit in the rectum, even if it is a very tight fit, they can be spayed. Experienced operators actually find ovariectomy in heifers easier than cows, even if the heifers are tight. This is because the ovaries are more easily found in heifers with less variability in location. They are also generally less fractious compared to cows. There can be large variations in ovary, uterine and pelvic size in cows, which can sometimes make it hard work to locate the ovaries. Observations from North America suggest that younger, smaller heifers bleed less so the smaller the better in terms of minimising mortalities from bleeding internally.

At 200kg, *Bos indicus* cross heifers are unlikely to get to advanced pregnancy or be sold and can be left to grow over this 200 kg threshold before ovariectomy using the DOT. However Shorthorn heifers might be heavily pregnant at this weight. In North America, 180 kg is the generally accepted lower limit for live weight of *Bos taurus* heifers to be operated on with the ovariotome.

**Body Condition**

Whilst animals in poor body condition can withstand the DOT, there are a number of reasons why it is ideal to wait until the body condition score (BCS) has improved prior to performing the procedure. Animals with a poor BCS are more prone to pneumorectum, which increases the difficulty and risks associated with the procedure. These animals are also more prone to be suffering anaemia from internal or external parasites. However, these cows are unlikely to get to advanced pregnancy or saleable condition before the next mustering round when they can be easily operated on with minimal set back.

**Time Since Calving (Postpartum Period)**

Recently calved cows should not be spayed using the DOT. The uterus is still recovering and discharging lochia for up to two weeks after calving. There is a danger of carrying infected
material on the head of the ovariotome into the abdominal cavity and causing peritonitis. In addition, the large postpartum uterus makes it more difficult to manipulate the ovaries. While there will be exceptions, it is recommended that cows be at least 4 weeks postpartum before being submitted for spaying using this technique.

**Stage of Pregnancy**

Early pregnant heifers, up to about 4 months gestation, can be ovariectomised with the ovariotome, but more advanced pregnancies may have to be managed using abortifacients or flank spaying, or be left to calve. Once the pregnant uterus begins to drop over the pelvic brim it usually drags the ovaries down with it, eventually out of reach. Difficulty reaching the ovaries, and positioning and seating the ovariotome on the ovaries, usually begins around 4 months of gestation. An experienced operator should be able to remove 100% of ovaries in heifers up to 4 months of gestation but would be unsuccessful in removing one or both ovaries at a rate of about 20% for each month after 4 months. These animals can easily be spayed at the next round if they have been calved out for 4 weeks or more. There is no major impact on lactation and cows mother up well after the operation.

If there is an urgent need to ovariectomise an animal in advanced pregnancy then this will have to occur by the flank method, or the animal will have to be aborted using drugs prior to using the DOT technique. But note that interfering with mid to late term pregnancies can result in cow and calf death. The economics of terminating an advanced pregnancy are also questionable. It is recommended that animals be left to calve out.

**Feed and Water**

A 24 hour feed curfew may make the operation easier for novices by reducing rumen size, but experienced operators can usually work around a large rumen with little problem. It is best to leave animals on water, or have only a short water curfew, to prevent drying of the rectum which makes the job more difficult.

**Time of Year**

Animals spayed using the DOT are better able to tolerate climatic extremes than animals ovariectomised by the flank method because it is a simpler, less stressful operation. The loss of circulating blood is the reason that spayed animals maybe stressed by cold weather and should not be vigorously exercised in the first week post spay. Therefore, due consideration should be given to deferring the operation if conditions become extreme. Heavy tick burdens and dehorning at around the same time, particularly in the late dry season may result in too severe a stress on the animal.

**Equipment used for the DOT**

**Basic Setup**

A modern veterinary crush with a rear kick gate, head bail and squeeze is necessary for operator and animal safety. Where squeeze is not available, then improvisation with old car tyres wired inside the crush may achieve the same result. Likewise a kick gate can be replaced with a chain or rail. The head bail may not be required but is useful for getting animals into the crush. Use of the electro immobiliser (Stockstil) is usually not necessary except in very fractious animals, however individual operators should make their own informed decision on whether or not to use it. Use of the electric stock prod (jigger) should be kept to a minimum. Every situation is different and the best method of operation must be worked out on a case-by-case basis. It is important that the cattle are handled quietly in the backyard, forcing yards
and race so that they are not stirred up by the time they get to the crush.

**The Ovariotome**

The ovariotome is a simply designed, easily maintained vaginal spaying instrument. It is a stainless steel rod about 48 cm long and 6 mm diameter. One end has a T-bar handle, the other is a flattened spear head with an oval hole and slit cut in it (Figure 1). The forward end of the slit is sharpened to form a concealed cutting edge. This edge is used to cut the ovarian attachments and will require regular sharpening.

![Figure 1 - The working end of the Willis Ovariotome. The three sizes of ovariotome are shown here.](image)

The Ovariotome is made in three sizes (Figure 2); heifer, cow and large cow. Variation occurs in the size of the oval hole and the length of the handle. It is recommended that the minimum size ovariotome be used to complete the operation to minimise the chance of intestine accidentally entering the oval hole. The large cow ovariotome (super spayer) is usually only necessary in a small portion of cows over 400 kg live weight and in those animals with ovarian cysts. A small diamond file or chainsaw file is recommended to keep the cutting edge sharp. Both sides of the cutting edge in the ovariotome have the same edge angle.

![Figure 2 - Three sizes of the Willis Ovariotome. From top to bottom: Large-cow, cow and heifer sizes.](image)

**Crush-Side Equipment**

A list of equipment required for DOT spaying is listed in Appendix 3. Suggested protective equipment and a plan for layout of equipment around the crush are provided in Figure 3.
Palpation sleeve, wrist-length vinyl gloves, apron or overalls, shoulder protector and steel capped boots are all recommended for cleanliness and safety. Sunglasses are useful to prevent possible eye injury from whipping of the cow’s tail. Obstetrical lubricant (methyl cellulose) applied sparingly will greatly reduce the amount of effort required to insert the palpating hand and forearm arm into the cow's rectum and will reduce trauma to the rectal mucosa.

Figure 3 - An example of operator protective clothing for spaying and equipment layout. In particular, note the hat, palpation sleeve, and apron. Technicians might also consider the use of protective eye-ware, sunscreen, vinyl hand-gloves and steel-capped boots.

Following is a discussion of some specific items.

The ovariotomes in use should rest in a container of mild disinfectant (Figure 4). Recommended disinfectants are; Chlorhexidine (Hibitane) or Cetrimide (Savlon). Be careful to follow the manufacturers labelled mixing directions as under strength disinfectants are not effective and over concentrated disinfectant solutions can severely irritate the vagina and abdominal organs.
Figure 4 - The Ovariotre can be stored in a covered 20 litre bucket filled with disinfectant. Note how a small slit has been cut in the lid of the bucket to allow the ovariotre to be placed into the disinfectant while reducing the amount of dust entering the bucket.

A large wash bucket of clean water with a dipper should be used to rinse off faecal and dust contamination from the ovariotre and the apron and gloves of the operator. The disinfectant and wash buckets should preferably have a lid with a hole cut into it to reduce the amount of dust contamination. Another method in a more dust free environment is to store the ovariotomes in a cylinder of poly pipe containing disinfectant (Figure 5). The poly pipe cylinder is then placed in a larger bucket of fresh water. This method saves on disinfectant and helps to ensure contamination is removed from the ovariotre prior to placement in the disinfection solution.
Figure 5 - An alternative method of storing the ovariotome. The instrument is stored in a 10cm diameter PVC pipe that has been sealed at one end and filled with disinfectant. The pipe sits in a large bucket of water so that after each spay, the instrument can firstly be rinsed in the water before placing in the disinfectant.

A squirt bottle filled with mild disinfectant, or paper towels are useful in those animals that have faecal contamination of the tail and vulva. The majority of this contamination can be removed using the brush of the cow’s tail, followed by a wipe with paper towel. All of the equipment should be elevated off the ground by tables or drums to improve hygiene and to reduce fatigue associated with bending. The bucket used to hold the ovariotome and paper towel should be placed near the kick-gate in easy reach of the operator.

An essential part of the spaying procedure is to correctly identify animals at successful completion of the surgery with ear-marking pliers (Figure 6). The pliers should be used to punch a hole through the outer third of the ear of the animal.
Figure 6 - Ear-marking pliers to punch a circle in the ear of animals after spaying is completed.

Equipment Purchase

There are two manufacturers of the Ovariotome and associated equipment:

DLC Australia Pty Ltd. 17-19 Home St, Hoppers Crossing, Victoria 3029 Free call: 1800333044 Ph: 03 9318-1566/ 03 9360-9700 Fax: 03 93181912

Hayes Veterinary Supplies. 19 Tipuana Drive, Capalba, Queensland 4157 Ph/fax: 0732453933 Ph: 0732456426 Mobile: 019163993

The Dropped Ovary Technique – A Summary for Experienced Cattle Veterinarians

Experienced cattle veterinarians should view the dropped ovary video which is available from DLC Australia prior to practising the technique.

With experience, the essential steps to the technique are:

1. Restrain the heifer in a veterinary squeeze crush. Apply a suitable amount of squeeze to prevent the heifer from moving.

2. Insert your arm into the rectum of the heifer and identify the uterus and ovaries. Retract (unfurl) the ovaries if needed to ensure they are free of the broad ligament.

3. Wipe the vulva with the brush of the heifer's tail if needed. Remove contamination with paper towel or disinfectant solution. Grasp and hold the cervix, pushing it anteriorly.

4. Insert the Ovariotome into the vagina and push it anteriorly until it seats into the dorsal fornix of the vagina - in the 12 o'clock position, dorsal to the external cervical os.

5. Release the cervix, open the palpation hand and pull it slightly caudally and dorsally. In the same movement, push the ovarirotome forward, popping it through the vaginal wall so that the head of the device enters the caudal peritoneal cavity. Take care not to thrust forward too hard or the rumen may be penetrated. Direct the instrument at a slight angle
towards the right-hand side of the cow if the rumen is noted to be large.

6. Grasp an ovary with the rectal palpation hand and place it on the shaft of the instrument. Slowly push it along the instrument until it can be guided through the hole in the head of the instrument. Ensure the ovary passes freely through the oval hole.

7. With the ovary pushed through the hole of the instrument, use the thumb or finger to lock the ovary into place, and pull the tool backwards to slice the mesovarium and ovarian blood vessels.

8. Release the ovary, allowing it to drop into the abdomen. Repeat the procedure for the other ovary.

9. Palpate to confirm severance of the ovaries if any doubt exists.

10. Withdraw the ovariotome, rinse it in chlorhexidine solution and place it in a bucket of clean chlorhexidine solution in preparation for the next heifer.

11. Use the hole punch to punch a circular hole in the left ear of the heifer to indicate she has been spayed.

12. Release the heifer and move the next animal into the crush.

**Training in the Dropped Ovary Technique – Basic Competency**

Lay candidates are advised to check the legal situation in the state or area in which they might operate to ensure they are able to perform the technique in a commercial environment.

It is recommended that prospective candidates have skills in either bovine pregnancy diagnosis or artificial insemination prior to attempting to learn this technique. Without knowledge of basic anatomy, stages of pregnancy and some prior experience, the student will find it difficult to master the DOT.

A teaching CD titled “Palpation of the bovine reproductive tract” is available from The University of Queensland and provides valuable information on basic anatomy and palpation techniques.

Prior to commencement of training on live animals, the technique should be rehearsed on reproductive tracts of slaughtered females obtained from an abattoir. A training video available from DLC Australia Pty Ltd should also be viewed.
Figure 7 - Reproductive anatomy of the cow with the dorsal wall of the vagina opened to allow visualisation of the urethral opening, cervical os and vaginal fornix.

Training subjects

Every effort must be made to protect the welfare of the animals used in training sessions. Suggested points to consider include, but are not limited to, the following:

Relevant state and national legislation and codes of practice must be adhered to.

The course coordinator has an obligation to inform cattle owners of limitations and complications associated with training technicians in the procedure.

Animal welfare considerations. Application for animal ethics approval should occur at least
two months prior to the anticipated course date.

Pre-surgical assessment of animal health and reproductive status of the subjects.

Patient management before, during, and after operating.

Methods and standards of restraint

Operator limitations such as fatigue, hand size, size of fore-arms

Animal identification to obtain feedback

Processing rates (3 to 6 /hr when learning)

Managing technical problems encountered during the procedure i.e. pneumorectum, obstructions from the broad ligament, deep vaginas

Spaying pregnant animals. It is recommended not to include animals beyond 3 months of gestation in training days.

Management for rapid convalescence

The Dropped-Ovary Technique – Procedure for Novices

The recommended technique for novices is as follows: With the cow suitably restrained, a gloved hand and forearm coated with methylcellulose obstetrical lubricant is inserted into the rectum. The fingers are extended under any faeces and the cervix and the uterus are located. The cow's tail should be dropped out of the way over the outside (back) of the palpating arm to keep it clear of the vulval opening. A quick sweep of the pelvic brim with the fingertips will give a rough idea of stage of pregnancy. Palpation for the ovaries is not necessary unless the animal is approaching or exceeding 4 months gestation and the ovaries are descending out of reach, or there may be some doubt about the size or presence of the ovaries. It is essential that any ballooning of the rectum be reduced before puncture of the vaginal wall is attempted.

The vulvar lips and perineum are cleaned if necessary. Cleaning can be done with a gloved hand, the brush of the animal's tail, a dipper of water, or a wipe with a dry paper towel, whatever is required to remove dirt and faeces to prevent contamination of the instrument during insertion into the vagina.

With the head of the ovariotome perpendicular to the ground (I), the instrument is passed through the vulvar lips which may be parted by an assistant to reduce contamination. The instrument is then passed dorsally and cranially, manoeuvring past folds in the vaginal wall and avoiding the entrance to the urethra. Flattening the vagina and pushing the cervix forward with the wrist and fingertips of the hand in the rectum, will assist the passage of the instrument past the vaginal mucosal folds.

The head of the instrument is placed 1 to 3 cm dorsal to the external os of the cervix in the dorsal fornix where slight pressure is applied to keep it in place. The dorsal fornix is where the vaginal wall curves down and attaches to the cervix. It is critical that the head of the ovariotome be positioned at the 12 0' clock position relative to the cervical os. Correct ovariotome positioning can be checked by palpation with the hand in the rectum.

The shaft of the ovariotome should be parallel to the ground. With the instrument fixed in position, the hand in the rectum is raised upward and laterally to lift the rectum out of the way of the ovariotome as it is thrust through the vaginal wall. It is extremely important to NOT continue holding the cervix at this stage. With the cow standing level and quiet, a short forward thrust of the ovariotome will penetrate the vaginal wall at the dorsal fornix producing a "pop" sound or tactile sensation. The thrust occurs from a "standing start". A "run up" will usually dislodge the head of the ovariotome from its correct position in the dorsal fornix. The angle of penetration should be along the midline of the cow, or with a very slight bias to the
right-hand side to avoid damage to the caudal sac of the rumen. The flat surface of the head of the ovariotome should be parallel (-) to the ground at penetration.

Once the vaginal wall is penetrated (Figure 8) the ovariotome can be checked for freedom of movement to make sure it is not caught in the broad ligament or surrounded by loops of intestine. Then the instrument is gently pushed forward until the handle rests against the vulvar lips. This serves to distance the head of the instrument from the vaginal serosa and positions the head away from the area where rectal palpation of the ovaries resumes.

Figure 8 - This diagram shows the position of the ovariotome once the wall of the dorsal vaginal fornix is penetrated. Note the relative positions of the uterine horns and ovaries.

An ovary is located and grasped by the thumb and forefinger. Usually the pressure is best placed not on the ovary but rather its pedicle attachment to the broad ligament. The ovary may need to be unfurled from its broad ligament attachments (mesosalpinx and mesovarium) by extending the wrist and rolling the ovary in the fingers. It is generally easier to approach the ovary from the lateral side if it needs to be released from under the broad ligament. Be sure that only the ovary is grasped. It is then lifted onto the shaft of the instrument and placed on or behind the oval hole of the ovariotome from the **top side** (Figure 9). It is usually easier to move the head of the ovariotome to the ovary than to move the ovaries to the ovariotome.
Figure 9 - The ovary is lifted onto the shaft of the instrument and placed on or behind the oval hole of the ovariotome from the top side.

With the ovary pinned to the shaft or behind the oval hole, the instrument is drawn back until the ovary drops into the oval hole. It is first necessary to sweep the head of the ovariotome with the fore or middle finger to check that the oval hole is free of membrane or intestine. The instrument is rotated as necessary to facilitate this.

IF THE OVARY DOES NOT DROP EASILY INTO THE OVAL HOLE - DO NOT FORCE IT IN AND CUT IT OFF - START AGAIN FROM THE VAGINAL PENETRATION STEP!

After the ovary has passed through the oval hole, the thumb and forefinger are placed either side of the head of the instrument, thereby fixing the ovary (Figure 10). The thumb on top will press against the wad of tissue which is the mesovarium, the first finger joint of the forefinger will be pressed against the ovary. With the thumb and forefinger on either side of the instrument head and locking the ovarian pedicle into the cutting slot, the hand is moved forward and the ovariotome retracted in one slow, smooth action, over a distance of 2 to 6 cm.

Figure 10 - After the ovary has passed through the oval hole, the thumb and forefinger are placed either side of the head of the instrument, thereby fixing the ovary.
Slow, steady retraction of the instrument cuts the ovarian attachments and the ovary falls away. A grating sound may be felt as the ovarian pedicle is cut, the sensation of the ovary dropping away is confirmation that the ovary has been cut off properly. The ovariotome is then re-positioned forward and the process repeated on the second ovary. The ovariotome is then withdrawn, guarding the oval opening of the ovariotome until it is back in the vagina to avoid prolapse of intestine through the oval opening. The ovariotome is then completely removed, rinsed and replaced in the disinfectant.

Further rectal palpation may be performed to confirm ovariecotmy if there is any difficulty in cutting. Sometimes the severed ovaries float and can be felt at this check palpation. If any suspect ovaries are relocated, the ovariotome procedure should be reapplied to be certain of complete severance of all ovarian tissue. The instrument is then wiped and washed free of faecal material and placed in a plastic drum containing a solution of disinfectant. A drum with a rectangular slit in the lid is used instead of an open bucket to minimise dust contamination Figure 4.

The surgery should be done slowly and carefully with no attempt to hurry except in nervous heifers that are likely to move excessively. The emphasis should be on quiet handling, careful surgical technique, and applying a high standard of hygiene to minimise complications.

The part of the procedure which generally causes most reaction from the heifer is when the ear marking pliers are used to cut the spay mark in the ear.

**Impediments and Hindrances**

There are common impediments during the learning phase which are overcome with practice. These include difficulty in penetrating the vaginal wall, difficulty locating one or both ovaries after the instrument is in place, the head of the instrument becoming caught in the broad ligament, excessive animal movement, difficulty severing the ovary, the head of the ovariotome becoming caught in vaginal folds, and pneumorectum.

**Insertion**

Often the ovariotome gets caught in folds in the vaginal wall. In particular, it may get caught at the vestibulovaginal sphincter (remains of the hymen) if the entry angle into the vestibule was too low. Those with experience in AI will be familiar with the requirement to enter the vulval lips at an upward angle. The ovariotome must be retracted slightly and re-positioned for successful entry if it gets caught in vaginal folds. Stretching and flattening the vagina by pressing down with the palpation hand and wrist may help. Stretching the vaginal walls longitudinally by grasping or pushing the cervix away with the finger tips of the palpating hand usually allows swift, unobstructed entry of the instrument right up to the cervix. When the head of the ovariotome rubs against the cervix, a grating feeling is often felt. This will be a sensation familiar to those that have done AI. The grating feeling serves as an indicator that the instrument is fully into the vagina and not caught up in vaginal folds. If difficulties continue, check, by palpating in the vagina with a clean, lubricated, gloved hand, that the cow has a patent or developed vagina. Some do not (eg. freemartins). It is usually still possible to introduce the ovariotome if the ovaries are present. If the ovariotome enters too easily, check that the bladder hasn't been entered. If the bladder has been entered the animal often strains, urinates or dribbles urine in response.

**Penetrating the Vaginal Wall**

Penetration of the vaginal wall usually causes little or no reaction in the animal. Position the instrument directly above the cervix, in position, ready for penetration. It is usually not possible to enter the cervix. A reasonable degree of force is required to penetrate the elastic
vaginal wall and this is best done with a sharp pushing action (a controlled jab). Check your effort, a slow push will not penetrate. A distinctive "pop" sound is often produced when the vaginal wall is penetrated in the right place. Sometimes, considerable force is required to achieve penetration, particularly when penetrating very close to the cervix where the vaginal wall is thicker. Some experienced operators have sharpened the point on the head to reduce the effort of penetrating. This is not recommended for novices because of the danger of slicing internal organs with the sharper tip. Best results for achieving vaginal wall penetration are when the spearhead of the instrument is positioned one to two centimetres above the dorsal fornix. The vaginal wall may be penetrated several times without any problems. Make sure a loop of gut has not entered into the instrument before each withdrawal.

**Membrane Obstruction**

This is sometimes a major problem for novices and is usually evidenced by failure of the ovary to drop freely through the oval hole of the ovariotome. It feels like a thin membrane is covering the oval hole. Unless the head of the ovariotome is free of the vaginal and uterine subserosa, and the broad ligament suspending the uterus, and the ovary free of its mesenteric attachments, the ovary will not drop freely through the oval hole. If the instrument is channelling under the serosa of the uterus, hold the uterus to one side and complete the penetration similar to deep vaginas (see Deep Vaginas). Membrane obstruction usually occurs because initial penetration of the vaginal fornix has occurred at other than the 12 o'clock position relative to the cervix. This can result in burrowing of the ovariotome through or under the thin broad ligament or uterine subserosa. The head of the ovariotome is covered by a thin, sometimes barely palpable membrane and the ovariotome head must be palpated to determine the cause of the obstruction. Experienced operators can easily detect this 'glad wrapping' effect. If it is membrane, it can be gently broken away by sweeping the tissue to the lateral or underside of the head of the ovariotome, gently back toward you whilst moving the head gently forward. A surging feeling is felt when the head breaks free. The ovariotome should then be kept forwards. Pulling back on the instrument will cause the head to become covered with membrane again; therefore the ovaries need to be carried forward to the head to be cut off. When these manoeuvres fail to clear the obstructing membrane from the ovariotome, it is best to withdraw into the anterior vagina and re-penetrate. In fat animals, it is also possible to have pelvic fat bodies obstructing the ovariotome and these must be treated in the same manner. Above all, make sure that the membrane is in fact not a loop of the small intestine (runners) that has entered the oval hole. If it has, gently remove it before starting again.

**Finding the ovaries**

To complete the procedure successfully requires basic ovarian palpation skills sufficient to free the ovaries from their mesenteric attachments (the mesosalpinx, mesovarium, or broad ligament), pick them up and to manipulate them onto the shaft of the ovariotome. It is recommended that novices take the time to read the AVC publication on Pregnancy Diagnosis in Cattle, as this text provides a good summary of the anatomy of the reproductive tract and basic manipulation procedures. Alternatively, the CD titled “Palpation of the bovine reproductive tract”; available from the School of Veterinary Science at The University of Queensland provides good animations and images of the palpation procedure.

All cows have two ovaries unless someone has previously performed a unilateral ovariotomy. Check for earmarks or incision scars on the left flank. In the heifer, a place to commence searching for the left ovary is at the 9-11 o'clock position on the left pelvic wall and the right is often back on the pelvic floor at about 5 o’clock but often under the broad ligament. Some prepubertal heifers may have very small pea-size ovaries and it is best to
leave these if they cannot be manipulated confidently. With cows there are less rules because the uterus and its attachments are larger, longer and more mobile.

The recommended technique is to find the cervix and then the uterine horns. The ovaries can then often be located just back from the bend of the uterine horns out at right-angles. They usually sit right against the uterine horns but are sometimes found some distance out at right angles particularly in cows. It may be necessary to stretch the horn with a flick of the wrist to orientate the structures in a better position. Often the left ovary is easier to find and its manipulation will bring the right ovary into a more suitable position. Often the first ovary is found easily and the second is difficult to locate. This is often because of fatigue rather than lack of skill. Have a spell and you can usually find the second ovary quickly. The spell should involve removing your hand from the rectum for about 30 seconds to get the circulation going, but be sure to clamp the tail down so the animal does not suck air and develop pneumorectum. The instrument does not need to be withdrawn, simply place it up along side the rumen. If the ovary is still difficult to locate, go back to basic uterine retraction skills described in the ACV Pregnancy Diagnosis in Cattle manual to manipulate the ovary to a position where it is no longer covered by the broad ligament. In particular, read the technique on indirect retraction of the bovine uterus.

**Severing the ovaries**

Severing the ovarian pedicle is very easy with a properly sharpened instrument and is achieved by a slow backward pull on the instrument with no jerking required. As the ovarian pedicle is being cut, a grating feeling is apparent.

There are 3 reasons why an ovary might be difficult to remove:

1. If the ovary is wrapped up in membrane (mesosalpinx, or broad ligament) and placed through the oval hole it will be difficult to cut, in these cases the ovary should be removed, unfurled, and repositioned.

2. A loop of small intestine may accidentally have been pushed into the oval hole. It can be difficult to feel and the cutting sensation is the same. If in doubt, let go of the ovary and reposition it as severing the small intestine has almost invariably fatal consequences for the heifer.

3. Sometimes, in instruments with a wider than normal cutting slot, the ovary is not sufficiently through the oval hole and the ovarian tissue gets jammed in the cutting slot making it difficult to sever. The ovary should be repositioned or only a portion of the ovary will be removed. An ovarian stump can be palpated if some ovary has been left behind.

The ovariotome must be kept sharp (see Instrument care and maintenance). Severance is very difficult if the operator is tired and the cow's rectum is balloonning or straining. If the cow is straining, remove the palpating hand for 30 to 60 seconds to relieve operator fatigue and give the cow the opportunity to relax for a short while. Be sure to keep the tail head pushed down to prevent entry of air into the rectum. Sometimes the ovary is severed very easily, literally like a hot knife through butter, with a properly sharpened instrument. This can sometimes leave doubt as to whether the procedure has been successfully completed as the common cutting sensation may not be felt. It must be remembered that it is possible for the ovary to 'jump out' of the oval hole and so a check palpation must be carried out if there is any doubt.

In summary, if the ovary is difficult to cut off it could be due to:
1. Ovarian tissue in the cutting slot rather than the ovarian pedicle. In this case there is risk of incomplete removal of the ovary

2. A portion of the small intestine (commonly the jejunum) entering the cutting slot and it is being cut, or

3. The ovary being surrounded by part of the broad ligament

If the ovary is difficult to sever - STOP and REPOSITION

**Ballooning of the Rectum (wind sucking, pneumorectum)**

A relaxed rectum makes the procedure a lot easier. Some cattle have a tendency to suck air and develop pneumorectum even before the arm is inserted, particularly older cows in poor body condition. Cows that kneel down will also have a tendency to suck air and should be prevented from going down or stood up quickly if they do kneel. It takes a lot of effort to battle against a drum-like pneumorectum and there is a greater risk of rectal penetration or tearing. It is well worthwhile trying to get the animal to expel the air. This is done by full insertion of the palpation arm to grab the most anterior fold of the rectum and withdraw this caudally to create a peristaltic wave to expel the gas or get rid of the tight band. A gentle stroking action, particularly on the dorsal rectal wall, may encourage peristalsis. Repeated emptying of faeces from the rectum is not recommended because it causes air to suck into the rectum. If there are a lot of faeces in the rectum, firstly endeavour to slide your hand underneath it and learn to work with a pile of faeces on top of your arm. If the faeces are copious and dry, it may be necessary to remove some. However, remember to push the tail head over the anus each time the arm is removed in order to prevent air from sucking into the rectum.

**Large ovaries**

If the ovaries appear too large for the available ovariotome, the final test is to place the ovary over the oval hole and maintain full pressure whilst gently rocking the ovariotome. Ovaries up to about 50% larger than the oval hole can be forced through by maintaining pressure on the ovary and wriggling the ovariotome gently so that the ovary is 'rocked' through. **It is very important to check that a segment of gut or membrane is not the cause of the ovary not being able to drop easily through the oval hole.** Oversized ovaries can fit through but need to be oriented in the plane of least crosssectional area and massaged with some force. Most are oval shaped and the narrow profile will fit through easier. Additionally, if a corpus luteum is present on the ovary, it is possible to enucleate the CL with firm pressure on the ovary. Removal of the CL will generally reduce the size of the ovary by 50% or more. If it is not possible to sever one of the ovaries, remember to identify the cow to save time when she next presents for ovary dropping. Rarely, tumours and cysts will make it impossible to drop the ovaries and these animals must be handled in some other way.

**Pregnancy**

If both ovaries are still able to be felt on the pelvic brim, it is generally possible to sever them with the ovariotome. The "rollover" method may be necessary (see Other techniques). Extra care must be taken to distinguish between ovaries and cotyledons (Colloquially known as 'corks' or 'buttons'). Often in pregnant animals, the ovary on the pregnant side is tucked in under the uterine body in line with the cervix. It is difficult to find unless this is remembered. The present recommendation for spaying is that the Dropped-Ovary Technique be used rather
than the flank method and that animals greater than 4 months pregnant remain intact because of the previously discussed complications and difficulty associated with ovarietomy during mid to late-term gestation. Animals greater than 4 months pregnant should be left to calve and be spayed the following year when empty or early pregnant.

Adhesions

Following pregnancy or infection, scar tissue may develop around the ovary making it difficult to pick up and elevate above the broad ligament. The "rollover" method may be necessary (see Other techniques).

Abnormalities

Various rare conditions may be found such as incomplete vagina and recto-vaginal fistula, etc. In these circumstances, spaying can usually proceed with care.

Bladder

Occasionally a full bladder will be encountered which will feel like an 8 to 10 week pregnancy but without the characteristic junction of the horns and no ovaries. Always locate the cervix to check your orientation. Cattle have been known to have been accidentally ovarietomised through the bladder with the ovariotome and have made uneventful recoveries.

Cystic Ovarian Disease

If the cystic ovary will not fit into the oval hole of the available ovariotome, the ovary can be squeezed with the hand or may be punctured with the pointed head of the ovariotome. The ovary is grasped so that the ovariotome can be speared into the ovary without penetrating the rectum. After some agitation the ovary is again attempted to be introduced into the oval hole. Purchase of the large cow ovariotome will avoid most of these situations but cysts have been recorded up to one litre in volume.

Deep vaginas

These may be encountered in large cows. Pushing with the hand, flat behind the handle, usually gains the extra length needed and should be tried first. If the length of the vagina exceeds the available ovariotome shaft length it may be necessary to grasp the uterine horns and pull back below the point of the head of the instrument thereby pulling the vaginal wall against the head of the instrument to achieve penetration.

Other techniques

After gaining some experience it may be easier and quicker to place the ovary directly in the oval hole rather than pin it to the shaft first. Some operators prefer to pass the ovary into the oval hole from underneath (the "underneath method") but this is quite difficult for beginners.

Another technique known as the "rollover" method is to roll the head of the ovariotome onto the ovary. Both methods result in the ovary on top of the head pinned by the thumb, and the ovarian pedicle attachment beneath the head pinned by the forefinger.

The rolover technique is useful when the ovary cannot be lifted or freed easily due to pregnancy, adhesions, or non-reducible pneumorectum. In pregnant animals the ovarian pedicle is often short and thick and the rolover method allows the ovariotome to sit well down on the pedicle reducing the chance of a remnant of ovarian tissue being left behind. The
ovariotome is moved to the ovary and the ovary is placed on the edge of the oval hole. The ovariotome is rotated onto the ovary (usually anti-clockwise for left-hand palpators) so that the thumb is against the ovary on the upper most surface of the ovariotome. The ovary is then severed with the thumb pushing the ovary off. This technique may have more general application when the hand is tired. Years ago, it was not uncommon practice to remove the ovaries by tearing them off using the hand in the rectum. This is physically quite difficult, requiring strong hands and fingers. The technique is apparently easier in pregnant animals where the weight of the uterus serves as an anchor to pull against. The technique is not recommended in poor condition cattle as they are thought to have weaker rectal walls and hence are more easily damaged.

In North America some operators blunt the concealed blade (rather than sharpen it) and pull the ovary back into the vagina and tear the ovary off with further retraction on the instrument, thus exteriorising and removing the ovary. This is thought to reduce blood loss and also serves to remove the ovary for examination and confirmation that ovariection has been completed properly. This is not normal practice in Australia.

Some operators choose to pass the instrument into the vagina before entering the rectum with the palpating hand. This is a hangover from AI where the palpating hand is used to part the lips of the vulva for cleaner entry of the ovariotome.

Other operators choose to have the hand entering the rectum at the same time as the ovariotome is inserted in the vagina. The claim is that it is quicker because the instrument does not get caught in vaginal folds.

The Dropped-Ovary Technique – Management and Recording

Identification – Completed Spay

It is a legal requirement that ovariectomised cattle are identified by a circle earmark at least 1.5 cm in diameter (Figure 11). Earmarks should not be made until the operator has confirmed the spay procedure is completed. In the Northern Territory, the earmark can be in either ear as long as it does not interfere with an existing earmark, but they are most easily seen if placed in the same ear as the station earmark. Check local regulations in other states, as in many cases making ear marks in cattle is governed by legislation and stockmen need to be aware of their responsibilities. Earmarks should be placed in the outer third of the ear to maximise visibility. It is important to ensure that the circle of the ear is completely cut out and removed or it may regrow. Collecting the cut-out piece of ear into a tin located at the head of the crush is a good means of confirming the number of ovariectomised animals at the end of the day.

It is recommended that an ear mark or tagging system be developed to identify that an animal has been spayed and identifies the operator. It is also wise to keep records for future follow up particularly in the early learning stages.
Identification – Incomplete spay

It is essential to identify any cattle that have only had one ovary severed. For this reason it is important not to earmark the animal until the procedure is completed. There will sometimes be situations when only one ovary is severed. Animals in which only one ovary has been removed should ideally be identified with an ear tag. Alternatively, they can have a half-moon shape cut in the bottom edge of the ear using the standard earmarking pliers. **The ear tag or half-moon punch should be placed in the ear on the side on which the ovary has been removed.** The operation can then be completed at a later date with the operator having full knowledge of the status of the animal and the side of the remaining ovary.

Identification – Untoward Event

Should a mishap occur such as suspected intestinal laceration or penetration of the rumen or rectum, consider punching a hole in the ear and splitting the ear through the hole so that the animal can be readily followed up. Alternatively, identify the animal with an ear tag.

Complications and causes of death associated with the DOT

Stiffness

Observations under northern Australian conditions indicate that stiffness and straining might affect up to 5% of a mob with dropped ovaries, but disappears after one to two days.

Accidental penetration of the rectum or rumen

Accidental penetrations are avoided with good technique and are rare in good facilities. It
usually happens once or twice at training school, usually in the first few attempts by a student and then never again. Straining or pneumorectum has usually been present when rectal penetration has occurred. These conditions must be reduced before penetration occurs. Students must resist the temptation in their first few tries to hold on to the cervix when attempting to penetrate the vaginal wall. This would of course, guarantee puncture of the rectum.

Penetration of the rumen occurs when the cow is restless or is too full. Fatigue, pneumorectum, poor temperament and absence of food curfew will predispose. If a large rumen is noted at the time of ovariectomy, it may be possible to direct the ovariotome slightly to the right-hand-side during penetration of the vagina to avoid the caudal sac of the rumen.

If penetration of the rectum or rumen occurs, the animal should be treated with antibiotics such as oxytetracycline. There is often no illness, ill thrift or death noticed with rectal or rumen punctures, with animals generally making an uneventful recovery.

**Adhesions**

Adhesions of the uterus to the pelvic canal occur in some animals after ovariectomy. These might be from one or a number of causes. These include infection introduced from the vagina, infection from faecal contamination of the head or shaft of the ovariotome, organisation of clotted blood following haemorrhage from the site of ovariectomy, tissue trauma from rectal manipulation or movement of the instrument, or tissue irritation from the chlorhexidine used to disinfect the instrument. The most likely cause is from trauma and organisation of large blood clots that develop in the broad ligaments when the instrument has penetrated off to one side, particularly when their have been multiple "off centre" penetrations. Adhesions are usually incidental findings and have a very low occurrence of morbidity or mortality associated with them.

**Blood loss**

Deaths from internal haemorrhage occur rarely. It is possible that some animals have a clotting deficiency problem but most bleed-outs occur in poor temperament animals that overexert themselves in hot conditions and continue to be hyperactive after being released from the crush and yards. All ovariectomised cattle will bleed internally to some extent, but if the animals are left to settle in the yard for an hour or so the bleeding will stop. Animals that have lost a lot of blood internally will have white mucous membranes of the eye, mouth and vulva. They should be allowed complete rest and have plenty of good quality fresh water to drink. The blood is reabsorbed in about a week.

Pregnancy is a risk factor for internal bleeding because of the increased blood supply to the uterus and ovaries. However, the risk of excessive internal bleeding after ovariectomy with the ovariotome would be no greater than with flank spaying and probably less. This is because the common method of flank ovariectomy in northern Australia uses an ovariotome containing partly enclosed scalpel blades, which are very sharp. The cutting edge of the DOT ovariotome is not as sharp, and the ovary is severed more by a combination of tearing and cutting, than cutting alone. Superior haemostasis should be achieved by the increased vasoconstriction and clotting caused by the greater microtrauma created with the blunter instrument. In animals pregnant greater than 5 months in duration there is the added danger of cutting the middle uterine artery, which runs adjacent to the ovary, during ovariectomy. These

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1 Spaymate, DLC Australia Pty Ltd, Werribee, Victoria, Australia
animals bleed out rapidly and die quickly. Animals should be handled quietly in the first few days after the operation. Long musters or trucking are not recommended. Because there is no external wound there is not an urgent need to remove animals from the yards as there was for flank ovariectomy, except for the need to provide feed, water and shade. Care must be taken with dehorning at the same time due to the extra stress and bleeding. In heifers already suffering blood loss from dehorning, haemonchosis or ticks, blood loss into the abdominal cavity may be critical. Stress factors such as hyperthermia from high environmental temperatures, and overexertion in poor temperament animals, probably contribute significantly to internal bleeding. Deaths from anaemia in flank ovariectomised heifers and cows have been attributed to these 2 factors.

Intestinal Lacerations (‘Cut guts’) "Cut guts" occurs when a portion of the small intestine, usually the mid-jejunum, is forced into the oval hole with an ovary and either part of the wall is cut off or it is transected. If a loop of the small intestine is cut, then the cow should be destroyed as she will die of peritonitis in 24 to 48 hours. There are no practical surgical options to correct any of these problems unless a veterinarian is present and equipped to perform a laparotomy. In 1997, the first year of using the DOT in northern Australia, an initial mortality rate of greater than 2% was lowered to less than 1% after the problem of intestinal laceration was recognised. Interestingly, few intestinal lacerations were occurring at training schools, most problems were occurring after the training phase when the operator was developing some skill and speed. The golden rule is: *check that the hole is free first and if the ovary does not drop cleanly (freely) into the oval hole, do not cut it off*. Also, if the ovary proves unusually difficult to sever, stop and check for a reason. Some "cut guts" may be occurring when the instrument is being withdrawn, as a loop of intestine can sneak into the oval hole after the ovaries are severed. The problem tends to occur more in temperamental patients that are a continual moving target, or go down and then stand up. Loops of intestine are thrown back into the pelvic canal. Use of too much squeeze in a squeeze crush may also increase the risk by forcing the intestines back into the pelvic canal. There is varying opinion on the best method of reducing the risk of intestinal laceration. The risks might be reduced by a 12 to 24 hour feed curfew with limited access to water depending on the mustering history, but may also be reduced if the small intestine is full and stays well down in the ventral abdomen. Operators need to identify the method that best suits their situation and skill. However, being aware of these techniques provides options to vary the pre-surgical management if repeated problems with intestinal lacerations exist. Experienced operators with excellent palpation skills and technique and an awareness of "cut guts" should be able to eliminate this problem as a cause of mortality.

Peritonitis
Deaths due to infection from the vagina, uterus or ovariotome induced contamination are believed to be rare. If infection of the vagina or uterus (pyometra) is present, or the animal has not cleaned up after calving, the animal should not have her ovaries severed. Infection might be introduced on the head of the ovariotome or leak out of the oviducts and cause peritonitis. In one study, no sign of localised septic peritonitis around the penetration sites in the vaginal wall or around the pelvic canal and uterus were found in animals sacrificed 48 hours after the procedure.

Intestinal prolapse
The sites in the vaginal wall where penetration occurs are small and contracted and difficult to locate at autopsy 48 hours post ovariectomy. Very slight bruising and haemorrhage reveal their location. They pose no danger in allowing prolapse of intestines to occur and intestinal
prolapse has not been recorded as a cause of death. The condition is only recorded here due to its theoretical possibility.

**Management after using the DOT**

**Convalescence**

Ovariectomised animals should be allowed to settle in a large yard for an hour or two after the operation before moving quietly to pasture. There is no hurry to remove cattle spayed using the DOT from the yard. A minimum period of two weeks convalescence should be allowed before sale, particularly where early pregnant animals have been spayed, as these animals will abort. There are usually no problems with infections following the loss of these early pregnancies, but ovariectomised animals should be kept under surveillance.

**Feed and water**

There are no special requirements, to minimise losses and hasten recovery, ovariectomised cattle should be put on good quality and quantity feed and water and not have to walk long distances in between to get it. They should be walked to a water point so they know where water is. Animals that have lost some blood internally will need a good drink to hasten recovery.

**Post mortem**

All ovariectomised animals that die should be autopsied to determine the cause of death so that future mistakes can be avoided. Any female cattle used for killers for rations are also useful to familiarise oneself with the reproductive and pelvic anatomy of the cow.

**Further advances in pregnancy control**

The development of simply administered hormonal implants or vaccines to control pregnancy is the long term goal. This would avoid the need to surgically ovariectomise cattle altogether. Until this goal is achieved, the ovariotome is a major advance in bovine pregnancy control.
References and recommended reading

Appendix 1

Draft training certificate for lay technicians using the DOT trained by a veterinarian

This is to certify that

John William Smith

has undergone training in the theory; and practice of the Willis Dropped-Ovary Technique at Kimberley Plains station on the 19th and 20th of June, 2007.

The course involved basic reproductive anatomy of the cow, viewing a training video, rehearsal on wet specimens, and performing the Willis Dropped-Ovary Technique on live cattle under supervision.

Subjects covered were:

1. Relevant state and national legislation and codes of practice
2. Obligations to inform cattle owners of limitations and complications
3. Animal welfare considerations
4. Pre-surgical assessment of animal health and reproductive status
5. Patient management before, during, and after ovariectomy
6. Methods and standards of restraint
7. Operator limitations eg. fatigue, hand size
8. Animal identification to obtain feedback
9. Processing rates and efficiency
10. Managing technical problems encountered during the procedure eg. pneumorectum, membrane obstructions, deep vaginas
11. Dropping ovaries in pregnant animals
12. Management for rapid convalescence

JR Bloggs BVSc 29 June, 2007
Appendix 2

Bovine Pregnancy Diagnosis Field Guide for the Estimation of Pregnancy Duration

Remember that an estimation of the duration of pregnancy is based on the interpretation of several sources of information, including the history of the animal. At different stages, you will emphasise different criteria. Guides to stage of gestation should be interpreted with a view to age and breed of the dam. The accuracy of fetal aging decreases quite markedly after about 5-6 months. Constant practice, with access to mating dates will refine your abilities in this field. Try to avoid being too definitive in your staging (eg. 45 days may be better expressed as between 6 and 7 weeks). Be sure that the owner is aware that this is an estimation.

<table>
<thead>
<tr>
<th>Stage of Gestation</th>
<th>Characteristic</th>
<th>Heifers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Empty</td>
<td>Absence of fluid filling in both horns</td>
<td>Unless on heat, can be very small,</td>
</tr>
<tr>
<td></td>
<td>Both horns tapered terminally</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Both horns thick walled and meat like consistency</td>
<td>soft, and hard to identify</td>
</tr>
<tr>
<td></td>
<td>Both horns slightly coiled</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tone varies with stage of oestrous cycle</td>
<td>Easily fits inside your hand</td>
</tr>
<tr>
<td></td>
<td>Size and symmetry vary with degree of involution</td>
<td></td>
</tr>
<tr>
<td>35 days</td>
<td>Difficult to diagnose when inexperienced</td>
<td>Gravid horn half filled with fluid</td>
</tr>
<tr>
<td>5 weeks</td>
<td>Gravid horn 2 – 4 cm diameter</td>
<td></td>
</tr>
<tr>
<td>1 month</td>
<td>Corpus luteum of pregnancy on same side ovary</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Palpate distinct, thinner walled, fluid filled dilatation, Amniotic vesicle 0.7 to 1 cm (½ finger width)</td>
<td></td>
</tr>
<tr>
<td>42 days</td>
<td>Gravid horn 3 – 6 cm diameter</td>
<td>Palpate fluid in entire gravid horn</td>
</tr>
<tr>
<td>6 weeks</td>
<td>Amniotic vesicle small grape-sized (1.5 to 2 cm = 1 finger width)</td>
<td></td>
</tr>
<tr>
<td>1.3 months</td>
<td>Gravid horn half filled with fluid</td>
<td>Chorio-allantoic membrane slip begins to be useful.</td>
</tr>
<tr>
<td></td>
<td>Asymmetry of horns marked.</td>
<td></td>
</tr>
<tr>
<td>50 days</td>
<td>Gravid horn 5 – 7 cm diameter</td>
<td>Non gravid horn</td>
</tr>
<tr>
<td>7 weeks</td>
<td>Amniotic vesicle 2.5 – 4 cm (1½ - 2 finger width)</td>
<td>half filled with fluid</td>
</tr>
<tr>
<td>1.7 months</td>
<td>Gravid horn only filled with fluid</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Marked asymmetry of horns</td>
<td></td>
</tr>
<tr>
<td>60 days</td>
<td>Gravid horn 6 – 9 cm diameter (just fits into hand)</td>
<td></td>
</tr>
<tr>
<td>8.5 weeks</td>
<td>Mouse sized foetus may be palpated</td>
<td></td>
</tr>
<tr>
<td>2 months</td>
<td>Non gravid horn filled with fluid</td>
<td></td>
</tr>
<tr>
<td>80 days</td>
<td>Gravid horn 9 – 12 cm (boxing glove)</td>
<td></td>
</tr>
<tr>
<td>11.5 weeks</td>
<td>On or just below pelvic brim (depends on parity)</td>
<td></td>
</tr>
<tr>
<td>2.7 months</td>
<td>Pea-sized placentomes just palpable</td>
<td></td>
</tr>
<tr>
<td>Time Frame</td>
<td>Description</td>
<td></td>
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<tr>
<td>------------</td>
<td>-------------</td>
<td></td>
</tr>
<tr>
<td><strong>100 days</strong></td>
<td>Gravid horn 10 - 15 cm (AFL football) “First spring” —</td>
<td></td>
</tr>
<tr>
<td>14 weeks</td>
<td>Rat sized foetus palpable udder</td>
<td></td>
</tr>
<tr>
<td>3.3 months</td>
<td>Faint fremitus in MUA on gravid side development</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10 cent coin sized placentomes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Can still just palpate greater curvature of pregnant horn</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(depends a little on breed and parity).</td>
<td></td>
</tr>
<tr>
<td>120 days</td>
<td>Uterus well down and forward</td>
<td></td>
</tr>
<tr>
<td>17 weeks</td>
<td>Distinct fremitus in gravid side MUA</td>
<td></td>
</tr>
<tr>
<td><strong>4 months</strong></td>
<td>MUA pencil thickness on gravid side</td>
<td></td>
</tr>
<tr>
<td></td>
<td>20 cent coin sized placentomes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Small cat sized foetus (1 – 2 kg)</td>
<td></td>
</tr>
<tr>
<td>150 days</td>
<td>Uterus well down to right of midline</td>
<td></td>
</tr>
<tr>
<td>21 weeks</td>
<td>50 cent coin sized placentomes</td>
<td></td>
</tr>
<tr>
<td><strong>5 months</strong></td>
<td>MUA little finger thickness on gravid side (9 mm)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Large cat sized foetus (3 – 4 kg)</td>
<td></td>
</tr>
<tr>
<td>180 days</td>
<td>Uterus not readily palpable Additional udder</td>
<td></td>
</tr>
<tr>
<td>26 weeks</td>
<td>Placentomes variable size 5+ cm development</td>
<td></td>
</tr>
<tr>
<td><strong>6 months</strong></td>
<td>MUA tortuous, small finger/finger thickness (1 – 1.5 cm)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MUA fremitus very distinct gravid side</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MUA fremitus variable non gravid side</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Foetus usually out of reach but may ballott</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Foetus beagle dog sized (5 – 10 kg)</td>
<td></td>
</tr>
<tr>
<td>210 days</td>
<td>Uterus beginning ascent</td>
<td></td>
</tr>
<tr>
<td>30 weeks</td>
<td>Placentomes 5 - 7.5 cm</td>
<td></td>
</tr>
<tr>
<td><strong>7 months</strong></td>
<td>MUA gravid side 1.5 cm (finger thickness), very tortuous</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MUA gravid side fremitus very obvious</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Foetus extremities may be palpated</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Foetus medium dog sized (8 – 18 kg)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hoof diameter 2 cm</td>
<td></td>
</tr>
<tr>
<td>240+ days</td>
<td>Uterus ascending well into pelvis</td>
<td></td>
</tr>
<tr>
<td>34 weeks</td>
<td>Placentomes 6 – 9 cm</td>
<td></td>
</tr>
<tr>
<td>----------</td>
<td>---------------------</td>
<td></td>
</tr>
<tr>
<td><strong>8 months</strong></td>
<td>Foetus head/extremities easily palpated</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Good foetal reflexes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MUA on gravid side thumb size</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MUA both sides very tortuous and distinct fremitus</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Foetus large dog sized (15 – 25 kg)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hoof diameter 3 – 4 cm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Udder development obvious in heifers</td>
<td></td>
</tr>
</tbody>
</table>
Appendix 3

Essential Equipment For Performing DOT

1. Ovariotomes x 3 sizes (plus spares)
2. Buckets x 2
3. Hibitane disinfectant
4. Hand and shoulder length gloves
5. Lubricant
6. Overalls/aprons
7. Safety Boots
8. Earmarking pliers
9. Ear tagging pliers and tags
10. Diamond sharpener
11. Paper towelling

Extra Equipment that may be useful

1. Table and chair
2. Knives
3. Waterbottle/panikan
4. Counter
5. Electric prodder
6. Hat/sunscreen
Appendix 4

Check List for Training Courses

1. DOT training video
2. Bovine reproduction CD for anatomy
3. Abattoir specimens of uterus and ovaries, cow pelvis
4. Facilities and females to spay
5. Equipment as listed in Appendix 3
6. Course notes
7. Post mortem kit
8. Veterinary kit containing lethabarb, antibiotics, possibly a firearm
Appendix 5

Suggested Draft Letter to Clients

To our customers wanting female cattle pregnancy control with the DOT

Ovariectomising (spaying) cattle with the DOT Ovariomet

The Dropped Ovary Technique (DOT) for spaying cattle has been used in North Australia since the mid 1990s. The technique is known as the Dropped-Ovary Technique because the ovaries are dropped inside the abdomen using a device designed by a veterinarian called Charles Willis. The animals may have one or 2 non-fertile heats after ovariectomy but soon stop. The ovaries need to be attached to the uterus for hormone production and cycling to occur. The dropped ovaries shrivel up and eventually disappear.

Some animals may not be spayed properly because this is a blind technique. The animals not properly done are usually poor temperament animals. An experienced operator working with quiet cattle and good facilities should be able to get 100% success. An experienced operator working with wild cattle in poor facilities might only get 95% of animals done completely.

The instrument, a stainless steel rod about 48 cm long and 6 mm diameter, is introduced into the vagina and placed against the wall above the cervix. The wall is pierced with the spear head end and the head of the instrument enters the abdomen. Each ovary is placed into the oval hole with the hand feeling in the rectum. The ovaries are cut off by pulling back on the instrument. The ovaries drop away into the abdomen.

The operation can be performed quickly (usually quicker than traditional flank spaying) and there is no external wound to become infected or fly struck. There is no hide damage or carcase trim. It is relatively painless for the animal and electroimmobilisers are often not necessary.

Death rates are about 1 in 1000 under good conditions and have rarely exceeded 2 per 100 in bad conditions. Lacerations to the intestines and internal bleeding have been the main cause of deaths. These animals tend to die within 24 to 36 hours of being spayed. Damage to the intestines is related to operator fatigue, which occurs with wild cattle, poor facilities, or too many cattle etc. When an animal throws itself around, sometimes the intestine gets thrown back into the pelvis and gets caught in the instrument. Internal bleeding from the site where the ovaries have been cut off can be a problem in wild cattle processed under hot conditions but is less of a problem than with the flank method. Death rates due to blood loss will increase if the cattle have also lost blood from ticks or dehorning, or are force-walked or trucked long distances after the operation. Cattle that are heavily pregnant also tend to bleed more. For this reason, it is not recommended to spay cows that are pregnant more than 4 months in duration.

How to achieve best results for your pregnancy control program:

1. Plan the spaying for the cooler months (May to September). Don't spay if environmental conditions are extreme or the cattle are under severe nutritional or weather stress. Cancel the procedure if there is a cold snap (i.e. winter rains), or the cattle might overheat in a hot spell.

2. The animals must be well restrained for the operation to be performed properly. The same level of restraint and crush design as would be required for artificial insemination is necessary.

3. Cattle submitted for spaying using the Dropped Ovary technique should be:
a. well handled and quiet and be accustomed to being worked in yards and races
b. empty or early pregnant (less than 4 months)
c. strong and able to go on to good feed
d. curfewed (feed and water) for about 12 hours prior to the procedure

4. Ideally, a wide area around the crush needs to be dust and mud free.

5. After spaying, avoid walking cattle long distances to paddocks, or using paddocks with no shelter (particularly if a cold wet snap or very hot conditions occur), little feed, or long distances to walk to water.

6. Cattle that have been spayed less than 10 days should be walked only short distances (less than 5 km) to their paddock and should be familiarised with a watering point.

7. Forced walks or trucking long distances should be avoided for about 10 days after spaying to give the cattle opportunity to fully recover from any bleeding.

8. Aim to have cattle free of ticks for approximately 3 weeks prior to spaying.

9. Plan dehorning so it is either more than 4 weeks before or after spaying.

**Appendix 6**

**Flank Spaying**

Flank spaying is a suitable technique for pregnant cows and heifers too small to physically perform the DOT on.

Restraint is similar to the DOT with access available to the near flank.

Local anaesthetic is applied to the area with an inverted “L” block using an automatic hypodermic syringe attached to a flexipack. This is applied before the animals enter the crush in the race that holds five or six animals. This routine allows ten or more minutes for the anaesthetic to take effect.

The restrained animal’s near flank is disinfected with a suitable solution that is not too irritant to the operator.

High on the flank a ten to twelve centimetre vertical incision is made using a Stanley knife with a parrot toothed blade or a “spay gun” (available from Hayes Veterinary Supplies). This should only penetrate the skin and the first muscle layer.

The left thumb is used to penetrate the remaining muscle layers splitting them along their alignments so as to create a self closing mesh on completion. When the hand penetrates to the abdominal cavity it is withdrawn slightly to allow air to enter. This will create an air pocket in the dorsal abdomen making it easier to locate the ovaries. The ovaries are held by the left hand, are severed from their attachments using a spaymate (available from Hayes Veterinary Supplies) and removed from the abdominal cavity.

Some antibiotic powder is applied to the wound before suturing.

Only the skin is sutured, using one large horizontal mattress suture. The most common material used is disinfected bag sewing twine. Needles used are either bag sewing needles, butchers needles or one made up using a scalpel blade on a longer handle. In North America stainless steel staples as used in pig snouts are used.

As in all surgical procedures, hygiene is the most important element for success.