Fig. 42. The changes of reproductive tracts in normal estrus cycle

<table>
<thead>
<tr>
<th>Estrus Stage</th>
<th>Day 0</th>
<th>2</th>
<th>4</th>
<th>6-7</th>
<th>9-10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ovary</td>
<td><img src="image" alt="Symbol" /></td>
<td><img src="image" alt="Symbol" /></td>
<td><img src="image" alt="Symbol" /></td>
<td><img src="image" alt="Symbol" /></td>
<td><img src="image" alt="Symbol" /></td>
</tr>
<tr>
<td>Uterus</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Size</td>
<td>1.5-2.5</td>
<td>1.5-2.5</td>
<td>1.5-2.0</td>
<td>1.5-2.0</td>
<td>1.5-2.0</td>
</tr>
<tr>
<td>Shape</td>
<td>Circle - Semi Circle</td>
<td>Circle - Semi Circle</td>
<td>Circle - Semi Circle</td>
<td>Circle - Semi Circle</td>
<td>Circle - Semi Circle</td>
</tr>
<tr>
<td>Contraction</td>
<td>+ - #</td>
<td>+ - #</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Thickness</td>
<td># - #</td>
<td>+ - #</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Inner Feeling</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Cervix</td>
<td>Swelled, Open</td>
<td>Open</td>
<td>Closed</td>
<td>Tightly Closed</td>
<td>Tightly Closed</td>
</tr>
<tr>
<td>Vagina</td>
<td>Congested, Glossy</td>
<td>Mucous, Bleeding</td>
<td>Dried Mucosa</td>
<td>Dried Mucosa</td>
<td>Little Wet</td>
</tr>
<tr>
<td>Vulva</td>
<td>Swelled, Deep Wrinkle</td>
<td>Deep Wrinkle</td>
<td>Shrivel, Small Wrinkle</td>
<td>Small Wrinkle, Shrivel</td>
<td>Small Wrinkle, Shrivel</td>
</tr>
<tr>
<td></td>
<td>12-14</td>
<td>16-17</td>
<td>19-20</td>
<td>21 (0)</td>
<td></td>
</tr>
<tr>
<td>Ovary</td>
<td><img src="image" alt="Symbol" /></td>
<td><img src="image" alt="Symbol" /></td>
<td><img src="image" alt="Symbol" /></td>
<td><img src="image" alt="Symbol" /></td>
<td><img src="image" alt="Symbol" /></td>
</tr>
<tr>
<td>Uterus</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Size</td>
<td>1.5-2.0</td>
<td>1.5-2.0</td>
<td>1.5-2.5</td>
<td>1.5-2.5</td>
<td></td>
</tr>
<tr>
<td>Shape</td>
<td>Circle - Semi Circle</td>
<td>Circle - Semi Circle</td>
<td>Circle - Semi Circle</td>
<td>Circle - Semi Circle</td>
<td></td>
</tr>
<tr>
<td>Contraction</td>
<td>+</td>
<td>+ - #</td>
<td>+ - #</td>
<td>+ - #</td>
<td>+ - #</td>
</tr>
<tr>
<td>Thickness</td>
<td>+</td>
<td>+ - #</td>
<td>+ - #</td>
<td>+ - #</td>
<td>+ - #</td>
</tr>
<tr>
<td>Inner Feeling</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Cervix</td>
<td>Tightly Closed</td>
<td>Little Swelled</td>
<td>Swelled, Open</td>
<td>Swelled, Open</td>
<td></td>
</tr>
<tr>
<td>Vagina</td>
<td>Dried</td>
<td>Dried</td>
<td>Congested, Clear Mucous</td>
<td>Congested, Glossy</td>
<td></td>
</tr>
<tr>
<td>Vulva</td>
<td>Small Wrinkle, Shrivel</td>
<td>Deep Wrinkle</td>
<td>Swelled, Deep Wrinkle</td>
<td>Swelled, Deep Wrinkle</td>
<td></td>
</tr>
</tbody>
</table>
6. Pregnancy Diagnosis

6-1 Anatomy of Pregnancy

After the fertilization, the embryo will enter to the uterus from the oviduct (Day5).

After the development (Ref. to Fig. 16), at Day9-10 the blasocyst will hatch as Fig.43.

Fig.43 Hatching Blastocyst

In blastocyst stage, the differentiation of the embryonic cells has already started. The Inner Cell Mass will become fetus, and the Trophoblast will be placenta. After the hatching the embryo will have a longer shape (elongation), and at about Day30 the implantation will occur. However the formation of placenta will start about Day40. After the implantation the amnion is formed around the fetus, then the fetus is protected by the double bags.
Day 30 Fetus

Placenta not yet formed.

---

The structure and type of the placenta is different among animal species as follows:

<table>
<thead>
<tr>
<th>Type of Placenta</th>
<th>Animal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diffuse, epitheliochorial</td>
<td>Horses and pigs</td>
</tr>
<tr>
<td>Cotyledonary, epitheliochorial</td>
<td>Ruminants (cattle, sheep, goats, deer)</td>
</tr>
<tr>
<td>Zonary, endotheliochorial</td>
<td>Carnivores (dog, cat, ferret)</td>
</tr>
</tbody>
</table>
Discoid, hemochorial Humans, apes, monkeys and rodents

**Fig. 47 Different btypes of Placenta**

As we can see in Fig. 49, Cattle’s placenta, the placentome is a combination of mother-side placenta (caruncle) and fetus-side placenta. The palpation of placentome become possible from Day75.

- Caruncle: Maternal side
- Cotyledon: Fetus side

\[\text{Caruncle} \cup \text{Cotyledon} = \text{Placentome}\]
6-2. Importance of Early Pregnancy Diagnosis

The early pregnancy diagnosis is important because of the following reasons

・ More calving number during the life-time of cows
・ More Milk Production
・ Too long drying period causes pre- & post- calving disease
・ “Early Diagnosis, Early Treatment”

Optimum Calving Interval = 365 days

To achieve this, cows should be mated and become pregnant at 85 days after calving.

6-3 Methods for Pregnancy Diagnosis

There are several methos to diagnose pregnancy of cattle. However, still the rectal palpation is the choice of the method because of its cost and practicality.

Estrus Detection  “Non-Return”(estimation only)
Rectal Palpation
Ultrasonography
Milk or Plasma Progesterone
The following table shows the comparison of these methods, how early the method can be conducted, diagnosis accuracy and cost. We can realize that the accuracy of the rectal palpation especially for positive cattle is very high.

### Comparison of Early Pregnancy Diagnosis Techniques

<table>
<thead>
<tr>
<th>Technique</th>
<th>Early testing</th>
<th>Diagnosis Accuracy</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rectal palpation</td>
<td>+</td>
<td>+++</td>
<td>+</td>
</tr>
<tr>
<td>Transrectal ultrasound</td>
<td>+ +</td>
<td>++++</td>
<td>++++</td>
</tr>
<tr>
<td>Milk progesterone</td>
<td>+++</td>
<td>++</td>
<td>+++</td>
</tr>
<tr>
<td>Early Conception Factor</td>
<td>++++</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

As the fetus is growing everyday, the examining points also changed depending on the fetus’s age. The following changes should be kept in mind when you check the female.

### Changes of Uterine Position, Size and Palpable structures

<table>
<thead>
<tr>
<th>Days of Gestation</th>
<th>Uterine Position</th>
<th>Uterine Diameter</th>
<th>Palpable Structures</th>
</tr>
</thead>
<tbody>
<tr>
<td>35-40</td>
<td>Pelvic floor</td>
<td>Slightly enlarged</td>
<td>Uterine asymmetry /fetal membrane slip</td>
</tr>
<tr>
<td>45-50</td>
<td>Pelvic floor</td>
<td>5.0 - 6.5 cm</td>
<td>Uterine asymmetry /fetal membrane slip</td>
</tr>
<tr>
<td>60</td>
<td>Pelvis</td>
<td>6.5 - 7.0 cm</td>
<td>Fetal membrane slip /abdomen</td>
</tr>
<tr>
<td>90</td>
<td>Abdomen</td>
<td>8.0 - 10.0 cm</td>
<td>Small placentomes /fetus (10-15 cm long)</td>
</tr>
<tr>
<td>120</td>
<td>Abdomen</td>
<td>12 cm</td>
<td>Placentomes /fetus (25-30 cm long) /fremitis</td>
</tr>
<tr>
<td>150</td>
<td>Abdomen</td>
<td>18 cm</td>
<td>Placentomes /fetus (35-40 cm long) /fremitis</td>
</tr>
</tbody>
</table>
Also the following is a simple calculation method of fetus body length. In case there were aborted fetus, we can know when the fetus was dead.

### Estimation method of Fetus Body Length

<table>
<thead>
<tr>
<th>Gestation period (mth.)</th>
<th>Fetus Body Length (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>A x (A + 1·2) cm</td>
</tr>
<tr>
<td>2</td>
<td>2 x (2 + 1·2) = 6 – 8 cm</td>
</tr>
<tr>
<td>3</td>
<td>3 x (3 + 1·2) = 12 – 15</td>
</tr>
<tr>
<td>4</td>
<td>4 x (4 + 1·2) = 20 – 24</td>
</tr>
<tr>
<td>5</td>
<td>5 x (5 + 1·2) = 30 – 35</td>
</tr>
</tbody>
</table>

#### 6-4 Diagnosis by Fetal Membrane Slip

Fetal Membrane Slip is the diagnosis method used for more than Day30 of pregnancy. To conduct this method for early pregnancy diagnosis (Day30-40), the uterus should be lifted up and reversed (Fig.51) (Ref. to 4. Rectal Palpation Method).

**Fig.50 Fetal Membrane Slip**

Schematic drawing of a cross section of the bovine pregnant uterine horn showing pregnancy diagnosis by the "fetal membrane slip." Note the double fold formed by the uterine wall (a) and the chorioallantoic membrane (b). The thickened segment (c) represents a cross section of the connective tissue band, where blood vessels are imbedded.

*(Hafez, E. S. E., 1968)*
Fig. 51 Lift-up & Reversion of Uterus

(1)-(3): Lift-up of the uterus from abdominal cavity to pelvic cavity

(4): Reversion of Uterus (the forefinger is inserted into the bifurcation)

(5): Reversion of Uterus (both horn are lifted-up and reversed)

(6): Now easily palpated at the tip of horn.
**Fig. 52  Fetal Membrane Slip**

(1) The thumb and forefinger are surrounded around the horn.

(2)-(3) Slowly move the fingers across the horn

(4) Fetal membrane (Amnio-Chorion) was slipped out from the fingers.

Slipped-out membrane
(Palpating sites for fetal membrane slip in early pregnancy diagnosis)

The palpation site for the fetal membrane slip is different according to the fetus's age. In less than 40 days the membrane slip can be felt only in the pregnant horn, but after 40-45 days the slip can be felt in non-pregnant horn. For a skilled technician, the pregnant diagnosis is possible at 30 days, if the uterus can be fully lifted-up and reversed.

**Palpation site**

<table>
<thead>
<tr>
<th>Time</th>
<th>Site Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>30-40 days</td>
<td>The tip of the pregnant horn</td>
</tr>
<tr>
<td>&gt;40-45 days</td>
<td>Just after the bifurcation in the non-pregnant horn</td>
</tr>
</tbody>
</table>

**Fig.53 Palpation site for Fetal Membrane Slip (Day 30-40 days)**

---

**6.5 Fremitus**

There is also a symptom in pregnant cattle, called “Fremitus”. Fremitus can be felt because of the hypertrophy of Middle Uterine Artery. There is a fluid turbulence that gives a 'buzz' feeling, or a kind of vibration to the artery. Middle Uterine Artery is located in the broad ligament (Fig.54). Because the symptom appears in Day120 pregnancy, there is no
use for the early pregnancy diagnosis. However, the fremitus can be used for the checking of the viability of fetus. When the fetus died in the uterus, the fremitus become very weak.

Fig. 54
The location of Broad Ligament

6-6 Checking order of Pregnancy Diagnosis

(1) Palpate the whole uterus (except the tip of the horns).
   Is there any difference of their sizes? (Asymmetry, Fig.55)

(2) Check the ovary
   Is there CL? and which side?

(3) (Day 30-40) The uterus is lifted-up and reversed, & check Fetal Membrane Slip in supposedly pregnant horn

   (Day 40-90) Check Fetal Membrane Slip in supposedly un-pregnant horn. After Day75 the placentomes can be felt

   (Day 90-120) Fetus can be felt. Check the placentomes

   (>Day 150) Because the fetus will drop down deeply to abdominal cavity, the Fetal Membrane Slip or checking of the fetus and placentomes become difficult.
   Check the fremitus.

Fig.55 Asymmetry of Uterus
Usually the pregnant horn and CL are the same side, but very rarely the inconsistency might happen as Fig.55. This is considered that the migration (movement) of early embryo had happened.

**Fig.56 Inconsistent sites of CL and Pregnant horn**

6-7 Pregnancy Diagnosis by Ultrasound

The ultrasound machine is a very useful tool as reviewed in Chap.2.4. The following table shows what kind of characteristics (signs) can be seen by ultrasonography according to the gestation period.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>First day detected</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>mean</td>
</tr>
<tr>
<td>Embryo proper</td>
<td>20.3</td>
</tr>
<tr>
<td>Heart beat</td>
<td>20.9</td>
</tr>
<tr>
<td>Allantois</td>
<td>23.2</td>
</tr>
<tr>
<td>Spinal cords</td>
<td>29.1</td>
</tr>
<tr>
<td>Forelimb buds</td>
<td>29.1</td>
</tr>
<tr>
<td>Amnion</td>
<td>29.5</td>
</tr>
<tr>
<td>Eye orbit</td>
<td>30.2</td>
</tr>
<tr>
<td>Hindlimb buds</td>
<td>31.2</td>
</tr>
<tr>
<td>Feature</td>
<td>Measurement</td>
</tr>
<tr>
<td>------------------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Placentomes</td>
<td>35.2</td>
</tr>
<tr>
<td>Split hooves</td>
<td>44.6</td>
</tr>
<tr>
<td>Foetal movements</td>
<td>44.8</td>
</tr>
<tr>
<td>Ribs</td>
<td>52.8</td>
</tr>
</tbody>
</table>

*Fig. 57  Pregnancy Diagnosis by Ultrasonography*
7. Peri-parturient Disease

There are many diseases in dairy cattle pre- and post- parturition stage. Because during the gestation and calving the cow has to have a large hormonal change inside her body and in some period suffer a low immunity condition. Also, in dairy cattle, the calving means the start of lactation. The lactation causes a large amount of energy requirement, then most of the dairy cattle fell in “Negative Energy Balance” (Fig. 58). These conditions will be the direct or indirect causes of many peri-parturient diseases.

These diseases are important not only for the immediate milk production but also for the later reproduction.

The following peri-parturient diseases can happen around the calving.

---

**Related to Gestation and Calving**
- Uterine Torsion
- Uterine Prolapse, Vaginal Prolapse, Calving Injuries
- Retained Placenta,

**Metabolic Disease**
- Milk Fever, Downer syndrome
- Ketosis, Acidosis
- Abomasum Displacement

**Infectious Disease**
- Puerperal Fever, Endometritis, Mastitis

---

**Fig. 58**

*Changes in energy balance (in MJ/d) in early and mid-lactation. (Source: Ferguson 1991)*
7-1 Negative Energy Balance and Reproductive Disorders after Calving

Fig.59 shows that the energy imbalance (deficiency and excess) and the deficiency of crude fiber from dry period to after calving will cause not only the metabolic diseases (Milk Fever, Ketosis, Mastitis, Acidosis, etc.) but also many kinds of reproductive disorders (Ovarian Dysfunction, Follicular Cyst, Silent Heat, Endometritis etc.).

7-2 Major peri-parturient diseases

7-2-1 Uterine Torsion

Uterine torsion usually occurs near term and is found at start of parturition. If the cow shows very restless behavior or abdominal pain, you’d better suspect this disease. This condition is assumed to be occurred because of loosening of uterine attachment or the manner that the cow rise and sit.

(Clinical signs)  • Delayed calving
  • Restless behavior at calving
  • Abdominal pain

(Diagnosis)  • Check of the cervix by palpation or vagina scope
In case of uterine tortion, we cannot touch or see the cervix and the vagina wall near the cervix is also is twisted.

- By rectal palpation we can find out the twisted uterus and crossed broad ligaments.
- Sometimes the vulva is also slightly twisted.

* During the diagnosis it is important to determine the direction of the tortion.

(Treatment)

- Manual correction of the fetus position
  
  (in case the tortioned angle is less than 90 degree and the fetus can be reached.)

- Rotation of the cow’s body
  
  (Make the cow’s body lie down making tortioned side below, and rotate the body to same direction of the tortion.)

- Caesariasn section
  
  (in case the tortion angle is 180 to 270 degree, and the cervix cannot be reached at all.)

7-2-2 Prolapse of Vagina or Uterine

Prolapse of vagina or uterine can occur usually after calving maybe because of excessive labouring for the delivery. Some factors may affect as predisposition of the diseases. These are uterine atony, hypocalcemia, lack of exercise before calving, sitting position with lower hindquarters, and the heredity.
(Treatment)

- Manual correction

The prolapsed tissue should be carefully cleaned before the correction, because they are often dry, necrotic and fragile.

In case the labouring is too strong, applied the epidural anesthesia. (Hinh 63, 5ml of Novocaine)

After the correction, putting 5-10 litter of normal saline inside uterus will be helpful.

- Suturing of Vulva

When the prolapse was easily recurred, the suturing of vulva using a kind of tape is recommended (Hinh 62). The tape should be removed as soon as possible after it become sure that the prolapse will not be repeated.

Hinh. 63

* Epidural Anesthesia can be widely applied as a local anesthesia for reproductive organ and hind part of the body. The injection needle should be put between the vertebral bones.

Hinh 64. Suturing of Vulva by tape
7-2-3 Retained Placenta

Although there are many factors to cause Retained Placenta, the real cause has not yet been cleared. These factors include, the local infection at the placenta, the deficiency of Vitamine (possibly vitamine A), lower contraction of uterus at calving, not–enough excercise of cow during dry period etc.

(Treatment)

・ Manual removal is not recommended, because this operation causes injuries of endometrium of uterus and always Endometritis will occur. If there is no other abnormality, no treatment is necessary.

・ Some part of the outside placenta can be cut, but don’t cut too much, some part of the placenta should be outside.

・ Be careful for the general condition of the cow, such as her appetite, milk quality and body temperature. In case the cow shows high body temperatute, Puerperal Fever, Endometritis or Mastitis might be the cause. Intra-uterine infusion of antibiotics is helpful together with intra muscular injection of antibiotics, if it is considered that the infection occurs in uterus.

7-3 Major metabolic diseases

7-3-1 Milk Fever (hypocalcemia)

(Clinical signs)  • Cow lie down (cannot stand up)
 • Low body temperature
 • Cold skin
 • Flaccid muscle

(Etiology)  Start of Lactation
                ↓
             Rapid increase of Calcium outflow into Milk
                ↓
         Decrease of Ca level in blood
                ↓
              Cow down

* Ca has an important role for contraction of muscle.

Ca metabolism inside the cattle body is considered as Fig.60. Usually cattle food contains enough amount of Ca, and the excess will be discharged into feces. If the deficiency of Ca occured, Ca will be mobilized from bone, which will work as Ca reservoir. When milk fever occurs, this Ca mobilization system might not work well.

Fig.65  Ca Metabolism in Cattle
(Prevention)

- Low Calcium Diet for Dry Cows
  - High Ca ⇒ decrease Ca mobilization from bone
  - Low Ca ⇒ promote Ca mobilization from bone
    * Low Ca diet before calving makes more efficient absorption of Ca from intestine possible

- Vitamin D injection before calving
  (promote the Ca absorption from intestine)

- Ca administration at calving

- DCAD (dietary cation-anion difference)
  It is necessary to know the mineral levels in all foods.

- Low potassium (K) level food before calving

(Treatment)

- Ca gluconate (iv) 500 ml x 2-3 times
- Vitamin D (supportive)

In case no good result is obtained by Ca injection, other diseases such as below should be checked.
  - Downer syndrome
  - Injuries at calving ?
  - Mastitis ?
  - Skeletal Muscle disorders ?
7-3-2 Ketosis

(Clinical Signs)
- occurs from calving to 6-8 weeks
- Low Appetite (esp. concentrate)
- Milk Production decrease
- Firm dry feces
- Odor of ketones on breath
- Neurologic signs
depression, salivation, gnash, ataxia, disturbed vision

(Etiology)
- Rapid increase of Milk Production
  ↓
  Negative Energy Balance
  ↓
  Mobilization of Body Fat
  ↓
  Production of Ketone bodies

- Too high protein diet
  too much production of butyric acid in rumen
  ↓
  Ketone bodies

- Secondary onset
  after Mastitis, Abomasal Displacement, Milk Fever,
  Retained Placenta etc.

(Diagnosis)
- Detection of ketone bodies in urine (by urine check paper stick, Fig.61)

- Diagnosis is easy. But, sometimes the ketosis might be the secondary case. Careful check is necessary whether another disease exists.

(Treatment)
- 30-50% glucose, 500 ml, (iv)

- Dexamethadone 10 ml, (im)
  (in case of mastitis, together with antibiotics)

- Glucose precursor (oral)
  Glycerol
  Propylene glycol
  Sodium propionate
Magnesium propionate

(Prevention)

- Keep good feeding management during dry period.

- Early reproduction
  (late reproduction ⇒ long dry period)

- Smooth transition from dry cow ration to lactating ration.

- Prevention of other periparturient diseases
  (hypocalcemia, retained placenta, metritis, displaced abomasum etc.)

**Fig. 66  Urine examination**

**paper stick**

---

### 7-3-2 Abomasum Displacement

“Abomasum Displacement” is abnormal movement of Abomasum (the fourth stomach). The abomasum move either left-side or right-side upward (Fig. 62). Usually the right-side displacement is more severe.

(Clinical Signs)

- Usually occur within one month after calving
- low appetite
- body temperature - normal or low
- passage of feedstuffs become difficult ⇒ "putty-like" feces
- Ketosis as a secondary disease

(Etiology)
- Abdominal space after calving
- Low fiber, high grain intake
- Too long dry period ⇒ high BCS

(Diagnosis)
- "pinging" sound using a stethoscope

(Treatment)
- Rolling the body (left-side displacement)
- Surgical operation

(Prevention)
- Same as Ketosis prevention
- Enough Dry Matter Intake before and after calving
Fig. 67 Abomasum Displacement

Abomasum Displacement (left)

Abomasum Displacement (right)
8. Calving Process & Assistance

8-1 Calving Process

To obtain a healthy calf is the final target of the reproduction. Therefore the special attention is necessary for mother and born calf. At first we have to learn about the normal calving process, then we can know if there is abnormality in the calving.

(1) Pre-symptoms of Calving

As the time of calving come near, the mother cow will show pre-symptoms for the calving as follows:

- Swelling of Udder
- Enlargement & Relaxation of Vulva
- Relaxation of Sacro-sciatic ligament
- Start of Cervix Dilation
- Body Temperature Change

Fig.68 Body Temperature Change and Calving Time

![Graph showing body temperature change and calving time](image)

Figure 4. Least squares means of body temperature before calving (SEM = .21) as affected ($P < .01$) by sex of calf from 144 to 56 h before calving (females, $n = 4$; males, $n = 3$).


Especially, the body temperature change will be a good tool to predict the exact time of calving. Fig.63 shows the relation of the calving time and the body temperature
change. We can see that the temperature starts to drop down from 36 hr. before calving and becomes the lowest at 16 hr. before. Therefore if the temperature increases again from the lowest, the calving will be several hours later. We need to check the body temperature for 8hr. interval (shorter interval is better). As this change is according to the Progesterone level change, we can predict the calving time with quite accuracy.

(2) Normal Calving Process

The calving process is divided to three stages until the placenta is expelled as below:

Stage 1: 2 to 6 hours (longer in heifer)
- Labor starts (clearer in heifer) (Fig.64)
- Watery discharge from vagina increases (water sac expelled) (Fig.65)
- Uterine contraction starts (15 min. → 3 min interval)
- Fetus rotates to upright position
- Cervix starts to open.

Stage 2: 1 to 2 hours (longer in heifer)
- Starts after the cervix is fully opened.
- Fetus enters the birth canal. (Fig.66)
- Second water sac (amniotic sac) can be seen. (Fig.67)
- Abdominal press accompanies the uterine contraction.
- Cow usually lie down.
- Calf's head and both forelegs coming out together.
- During the expulsion, the umbilical Cord will broken.
- The calf starts to breath.
- Calf delivery completed.

Stage 3: Normally 2 to 8 hours after calving,
- Placenta is expelled. If not expelled, it is considered as “Retained Placenta”.
  (Be careful for the cow not to eat it.)
Fig. 69 Labor Starts

Fig. 70 Water Sac Expelled

Fig. 71 Calf at Stage 1

Fig. 72 Second water sac (amniotic sac) expelled
8-2 Dystocia

The cause of dystocia is usually due to the body size of mother and calf, in short “smaller mother or/and larger baby”. There are some factors affecting their body sizes as below:

(Maternal Effect)
- Age (too early breeding)
- Body Size (inmaturity)
- Narrow Pelvic Area (sometimes hereditary defect)

(Fetal Effect)
- Body Size (sire’s breed, dam’s nutrition, sex)
- Abnormal Position
- Multiplet

8-3 Three Points to describe Fetus’s condition

In case of dystocia we have to know the exact condition of the calf. There are 3 points to describe calf's condition. These are Presentation, Position and Posture.

1. Presentation
   - Is calf coming Frontward, Backward or Transverse?

2. Position
   - Right side up or Upside-down
(3) Posture

Relationship of the calf's legs and head to its body

**Fig. 74** Presentation

- **Frontward**
- **Backward**
- **Transverse**

**Fig. 75** Position

- **Rightside-up**
- **Upside-down**
There are many types of abnormal conditions in case of dystocia.

**Fig. 76-1 Many types of calf's condition at calving (1)**

- **A.** Anterior presentation—one foreleg retained.
- **B.** Anterior presentation—forelegs bent at knee.
- **C.** Anterior presentation—forelegs crossed over neck.
- **D.** Anterior presentation—downward deviation of head.
- **E.** Anterior presentation—upward deviation of head.
- **F.** Anterior presentation—with back down.
8-4 Calving Assistance

Calving assistance is necessary depending on the condition. Unnecessary intervention is harmful to both Mother Cow and Calf. The important thing is to carefully observe the calving process. If the interval of each stage is too extended or the mother shows uneasiness or has seemingly a stomach pain, we have to give an assistance for the delivery.

At least the followings should be prepared before we start to assist the delivery.

(Preparation)

- Disinfectant
- Plastic glove
- Lubricant
- Ropes for pulling calf & constraining cow
- Scissors to cut Umbilical cord

First of all we have to define the condition of the calf if the calf is alive, how about the Presentation, Position and Posture of the calf. The point of the correction of calf is to correct as normal calving, in case the calf is coming forward.
presentation. The both legs should be extended and the head should be on the legs. In case of bacward presentation, if the position is rightside-up and the legs are straightly extended, it’s not so difficult. Just pull backward by the ropes tied to hind legs.

For an efficient assist, the shape of the pelvic opening (Fig.72) should be kept in mind. We can recognized that the shape of the pelvic opening is accorded with the calf’s body shape when the calf passes the opening in normal position.

**Fig.77  Shape of**

**Pelvic Opening**

8-5  **Nursing of Newborn Calf**

After the calf is expelled from the mother, the nursing as below is necessary for the newborn calf.

1. Make sure that the calf is breathing

   During the expulsion, the Umbilical Cord will be broken, then the calf starts to breath. Or in another word, the calf need to breath after the Umbilical Cord was broken. If the mucous or fractured membrane covers the nasal part of the calf, they should be removed as soon as possible. Sometimes we make some stimulation to nose to induce a sneezing (Fig.73), or hang the calf upside-down holding hind legs (Fig.74), or give an artificial respiration (Fig.75).

2. Make sure the calf drink Colostrum

   If calf can’t or don’t drink colostrum, give them 2 litter of colostrum within 1-2 hours after birth. This is important because the calf doesn’t receive any immunity during gestation, and the absorbing ability of the immunogloblin in the colostrum is time limited (Fig.76).
(3) Sterilization of the Umbilical Cord (Put 10% iodine solution or antibiotics inside the umbilical cord immediately after born.)

This is very important to prevent Naval Infection, if not treated, which can cause Septicemia, then Poly Arthritis. Poly Arthritis is the very difficult disease to treat (Fig.77,78).

Fig.78  Make a sneezing

Fig.79  Hang Upside-down

Fig.80  Artificially Respiration
Fig. 81  Efficiency of Immunoglobulin absorption of calf

Efficiency of Ig absorption

Time (hours) relative to birth

Fig. 82  Poly Arthritis

Fig. 83  Inside the joint of Poly Arthritis