

Bovine Fetal Development Curriculum



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Curriculum Structure

The *Bovine Fetal Development* curriculum is composed of the following lessons. Approximate lesson times are included.

Lesson	Title	Approximate Time
One	FOCUS: Sizes of a Fetal Calf	10 minutes
One	LEARN: Growth Stages of a Fetal Calf	30-40 minutes
One	REVIEW: Development Stages	10-15 minutes
	Total	1 hour

Lesson Structure

Each lesson begins with a Lesson Overview, Lesson Objectives, and a Lesson at a Glance table that lists lesson activities, materials required, suggested preparation steps, and approximate class time.

Lesson Sections

The actual lesson follows the overview, which contains some of the sections described below.

FOCUS

Every lesson begins with a FOCUS activity intended to capture participants' attention. This may be in the form of a small or large class discussion, a game, a demonstration, or a review of previous lesson information. During this activity, participants are introduced to the topic of the lesson.

LEARN

The LEARN activity in each lesson varies in its presentation mode. It may be a slide presentation, group activity, or demonstration.

REVIEW

The majority of lessons end with a REVIEW activity intended to briefly review the lesson's key messages or main points.

Lesson One – Growth Stages of a Fetal Calf

Lesson Overview

In this lesson, you will learn about the different stages of growth for a fetal calf, giving a month-by-month understanding of what main features are being developed during pregnancy for the calf.

Lesson Objectives

After completing this lesson, participants will be able to:

- Understand the different monthly development features of a fetal calf
- Understand basic reproductive terms for bovine and understand the estrus cycle for a bovine
- Learn the size differences of a fetal calf with each month of development

Lesson at a Glance

Activity	Materials	Preparation	Approximate class time
FOCUS	• Pens or Pencils • <i>Growth Stages of a Fetal Calf</i> presentation slides • <i>Sizes of a Fetal Calf</i> • <i>Sizes of a Fetal Calf</i> – Answer Key	1. Prepare to show <i>Growth Stages of a Fetal Calf</i> slide presentation. 2. Print/photocopy <i>Sizes of a Fetal Calf</i> worksheet (one per participant).	10 minutes
LEARN	• <i>Growth Stages of a Fetal Calf</i> presentation slides • <i>Growth Stages of a Fetal Calf Notes</i> • <i>Growth Stages of a Fetal Calf Notes</i> – Answer Key • Bovine Fetal Development Models	1. Prepare to show Growth Stages of a Fetal Calf slide presentation. 2. Print/photocopy <i>Growth Stages of a Fetal Calf Notes</i> worksheet (one per participant).	35-40 minutes
REVIEW	• Pen or Pencil • <i>Development Stages Chart</i> • <i>Development Stages Chart</i> – Answer Key Worksheet • Bovine Fetal Development Models	1. Print/photocopy <i>Development Stages Chart</i> worksheet (one per participant).	10-15 minutes

Lesson One – Growth Stages of a Fetal Calf

FOCUS: Sizes of a Fetal Calf

10 minutes

Purpose:

Participants will work in groups to test their knowledge of bovine fetal calf growth stages.

Materials:

- Pens or Pencils
- *Growth Stages of a Fetal Calf* presentation slides
- *Sizes of a Fetal Calf*
- *Sizes of a Fetal Calf* – Answer Key

Facilitation Steps:

1. Hand out the *Sizes of a Fetal Calf* worksheet.
2. Give participants 3-5 minutes to circle the animals or objects that they feel would compare to the size of a fetal calf during different months of pregnancy. Allow participants time to circle what they think. This is not a graded activity and is meant to get participants to start thinking in terms of size and developmental stages.
3. While the participants are answering the worksheet, put **slide 3** of the *Growth Stages of a Fetal Calf* presentation slides where participants can see the slide.
4. Once the participants have finished the worksheet activity, put **slide 4** of the presentation slides up for them to view, asking the participants if looking at this slide helps them with their answers. Ask them if they feel confident with their answers or if they want to change any.
5. Take the next few minutes to look at **slide 5** and go through the animations to show comparative animal sizes for different developmental phases of the fetal calf.

Name: _____ Class: _____

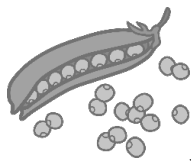
Sizes of a Fetal Calf

Sometimes it is best to compare and contrast the size of other animals/objects to understand the size of a fetal calf in different development stages of pregnancy. Circle the correct animal/object that would compare to the correct fetal calf development stage size.

1-Month Fetal Calf:



Orange

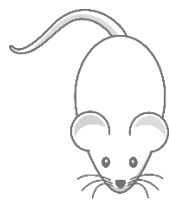


← Pea



Ant

2-Month Fetal Calf:



Mouse



Rabbit



Bird

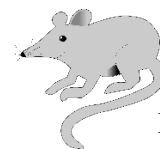
3-Month Fetal Calf:



Ferret



Red Panda

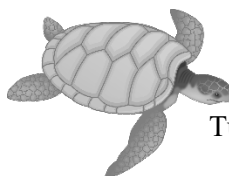


Rat

5-Month Fetal Calf:



Small Cat

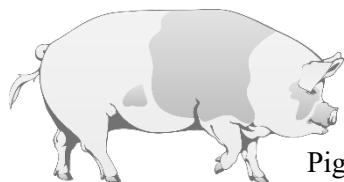


Turtle

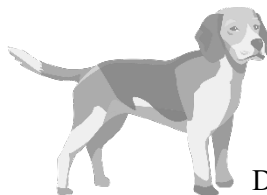


Chicken

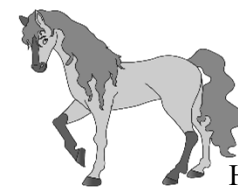
7-Month Fetal Calf:



Pig



Dog



Horse

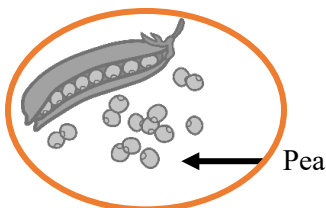
Sizes of a Fetal Calf – Answer Key

Sometimes it is best to compare and contrast the size of other animals/objects to understand the size of a fetal calf in different development stages of pregnancy. Circle the correct animal/object that would compare to the correct fetal calf development stage size.

1-Month Fetal Calf:



Orange



Pea



Ant

2-Month Fetal Calf:



Mouse



Rabbit



Bird

3-Month Fetal Calf:



Ferret



Red Panda

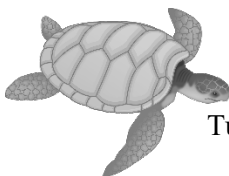


Rat

5-Month Fetal Calf:



Small Cat

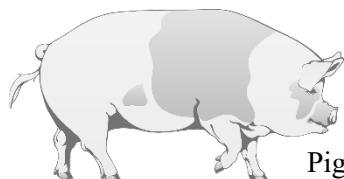


Turtle



Chicken

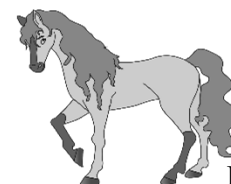
7-Month Fetal Calf:



Pig



Dog



Horse

Lesson One – Growth Stages of a Fetal Calf

LEARN: Growth Stages of a Fetal Calf

35-40 minutes

Purpose:

Participants will take notes to learn about the growth stages of a fetal calf.

Materials:

- *Growth Stages of a Fetal Calf* presentation slides
- *Growth Stages of a Fetal Calf Notes*
- *Growth Stages of a Fetal Calf Notes* – Answer Key
- Bovine Fetal Development Models

Facilitation Steps:

1. After the Focus activity, hand out the *Growth Stages of a Fetal Calf Notes* worksheet.
2. Have each participant take notes on the presentation slides that you show. For each slide, there should be areas to fill in with the notes.
3. Once you have handed out the participant notes, present **slides 6–24**, talking about some main developmental features that you can expect in a fetal calf during pregnancy.
4. As you go through each slide, have the Bovine Fetal Development Models present and able to demo some of the features for the different models available. This is a great place to hand out the models to your participants to touch and feel the developmental differences.

Notes for the presentation slides:

Slide 6: Bovine Heat Cycle

- Average heat for a bovine is between 15-18 hours
- In comparison to other animals, this is a short time of heat (less than 1 day in heat)
- If doing artificial insemination, it is important to do checks before inseminating to make sure that the bovine is ready to be breed

Slide 7: Estrus – Time in Heat

- Canine: 2-4 weeks
- Equine: 5-7 days
- Feline: 1-7 days

- Porcine: 2-3 days
- Bovine: 15-18 hours

Slide 8: Reproductive Cycle Times

<u>Animal</u>	<u>Estrous Cycle</u>	<u>Gestation:</u>
Canine	6-12 months	2 months
Equine	19-21 days	11 months
Feline	14-21 days	2 months
Porcine	19-21 days	3 m/3w/3d
Bovine	19-21 days	9 months

Slide 9: Basic Reproduction Terms

- Puberty: sexual maturity
- Ovulation: release of ovum (egg) from ovary
- Copulation: the act of mating
- Fertilization: union of male and female sex cells
- Conception: becoming pregnant

Slide 10: Basic Reproductive Terms

- Estrus: the time of receptivity to mating during the estrous cycle, also known as “heat”
- Estrous Cycle: the interim between two estrus periods
- Gestation: pregnancy
- Parturition: the act of giving birth

Slide 11: Corpus Luteum

- Main purpose of the corpus luteum is to help support pregnancy in mammals
- There are three stages that a corpus luteum goes through:
 - Corpus luteum 1 (CL1)
 - Corpus luteum 2 (CL2)
 - Corpus luteum 3 (CL3)

Slide 12: Corpus Luteum (cont.)

- This reproductive gland helps produce progesterone
- Progesterone is required to establish a pregnancy
- CLs also are important to maintain a pregnancy once pregnant

Slide 13: 1st Month of Development

This slide shows the different days and phases of heat. The main points to focus on here are the different developmental stages of the CLs. It is not

until around day 18-19 that a cow is ready to become pregnant. This stage must be monitored and watched closely.

Slide 14: 1st Month of Development

- 1st month is between 0-30 days of pregnancy
- Fetus at one month is no larger than a pea
- In many cases, you might not be able to feel/palpate it due to it being so small
- You may be able to feel fluid more around day 28 than the fetus itself

Slide 15: 2nd Month of Development

- 2nd month is between 30 and 60 days of pregnancy
- In early palpation, it is important to be very gentle as to not damage a pregnancy due to rough handling
- At two months, you will start to be able to feel the fetus; it is around the size of a mouse at this point

Slide 16: 3rd Month of Development

- 3rd month is between 60-90 days of pregnancy
- Toward the end of this month, the four compartments of the ruminant will start to be formed and recognized
- Fetus will measure about 14 cm in length
- For the male, the scrotum will start to become visible

Slide 17: 4th Month of Development

- 4th month is between 90-120 days of pregnancy
- In this month, the fetus's hooves become distinct, firm, will be a yellowish color, and will no longer be transparent but more of a solid color
- Fetus can weigh up to about 4-4.5 lbs. and between 9-11 inches in length

Slide 18: 5th Month of Development

- 5th month is between 120-150 days of pregnancy
- In the beginning of the month, the first tactile hairs start to form on the lips, chin, and upper eyelid of the fetal calf
- The calf's teats are now visible on the animal

- For a male fetal calf, the testicles have now moved into the scrotum
- Fetus is about 5.5 lbs. and 13-14 inches in length

Slide 19: 6th Month of Development

- 6th month is between 150-180 days of pregnancy
- Eyelashes are now more developed, and the facial features become more pronounced
- Remainder of the fetus's body still lacks hair
- Fetus is about 18-20 inches long

Slide 20 and Slide 21: 7th Month of Development

- 7th month is between 180-210 days of pregnancy
- Hair starts to appear other places on the body, besides the facial area
- Can start seeing hair on the tail and on the area around the horns
- Fetus runs about 23-24 inches in length at this stage

Slide 22: 8th Month of Development

- 8th month is between 210-240 days of pregnancy
- The animal's back and the edges of the ears start to gain a lot of hair
- Toward the end of the month, the calf will have almost a full coat of hair
- At the end of this month, the calf should be between 27-30 inches in length

Slide 23: 9th Month of Development

- 9th month is between 240-270 days of the pregnancy
- On average, a calf will be born between day 265-295 days, commonly many breeds are around 283 for an average
- At this stage, the calf will have developed and all teeth will be visible and present
- On average, a calf will be between 60-90 lbs. when born

Slide 24: Typical Stages of Growth

This chart highlights different physical features and when they first become present on the fetal calf.

Name: _____ Class: _____

Growth Stages of a Fetal Calf Notes

Follow the Growth Stages of a Fetal Calf presentation slides. Fill in the blanks as you go through the presentation slides.

Bovine Heat Cycle

- The average heat for a bovine is between _____ - _____ hours
- In comparison to other animals, this is a short time of heat (less than _____ day in heat)
- If doing artificial insemination, it is important to do checks before inseminating to make sure that the bovine is ready to be breed

Estrus – Time in Heat

- Canine: _____ weeks
- Feline: _____ days
- Bovine: _____ hours
- Equine: _____ days
- Porcine: _____ days

Reproductive Cycle Times

<u>Animal</u>	<u>Estrous Cycle</u>	<u>Gestation</u>
Canine	_____ - _____ months	2 months
Equine	19-21 days	_____ months
Feline	14-21 days	_____ months
Porcine	_____ - _____ days	3 m/3w/3d
Bovine	19-21 days	_____ months

Basic Reproduction Terms

- **Puberty:** sexual maturity
- **Ovulation:** release of ovum (_____) from ovary
- **Copulation:** the act of _____
- **Fertilization:** union of male and female sex cells
- **Conception:** becoming _____

Basic Reproductive Terms

- **Estrus:** the time of receptivity to mating during the estrous cycle, also known as " _____ "
- **Estrous Cycle:** the interval between two estrus periods
- **Gestation:** _____
- **Parturition:** the act of giving _____

Corpus Luteum

- The main purpose of the corpus luteum is to help support pregnancy in mammals
- There are three stages that a corpus luteum goes through

Corpus luteum 1 (_____)

Corpus luteum 2 (_____)

Corpus luteum 3 (_____)

Corpus Luteum (cont.)

- This reproductive gland helps to produce progesterone
- _____ is required to establish a pregnancy
- CLs also are important to maintain a pregnancy once pregnant

1st Month of Development

- The first month is between 0-30 days of pregnancy
- The fetus at one month is no larger than a _____
- In many cases, you might not be able to feel/palpate it due to being so small
- You may be able to feel _____ more around day 28 than the fetus itself

2nd Month of Development

- The second month is between 30-60 days of pregnancy
- In early palpation, it is important to be very gentle as to not damage a pregnancy due to _____ handling
- At two months, you will start to be able to feel the fetus; it is around the size of a _____

3rd Month of Development

- The third month is between 60-90 days of pregnancy
- Toward the end of this month, the four compartments of the _____ will start to be formed and recognized
- The fetus will measure about 14 cm in length
- For the male, the _____ will start to become visible

4th Month of Development

- The fourth month is between 90-120 days of pregnancy
- In this month, the fetus's hooves become distinct, firm, will be a _____ color and will no longer be transparent but more of a solid color

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- The fetus can weigh up to about 4-4.5 lbs. and between _____ and _____ inches in length

5th Month of Development

- The fifth month is between 120-150 days of pregnancy
- In the beginning of the month, the first tactile _____ start to form on the lips, chin, and upper eyelid of the fetal calf
- The calf's teats are now visible on the animal
- For a male fetal calf, the testicles have now moved into the scrotum
- The fetus is about _____ lbs. and about 13-14 inches in length

6th Month of Development

- The sixth month is between 150-180 days of pregnancy
- The _____ are now more developed, and the facial features are becoming more pronounced
- The remainder of the fetus's body is still lacks hair
- The fetus is about _____ - _____ inches long

7th Month of Development

- The seventh month is between 180-210 days of pregnancy
- Hair starts to appear other places on the body, besides the facial area
- You can start seeing hair start on the _____ and the area around the _____
- The fetus runs about 23-24 inches in length at this stage

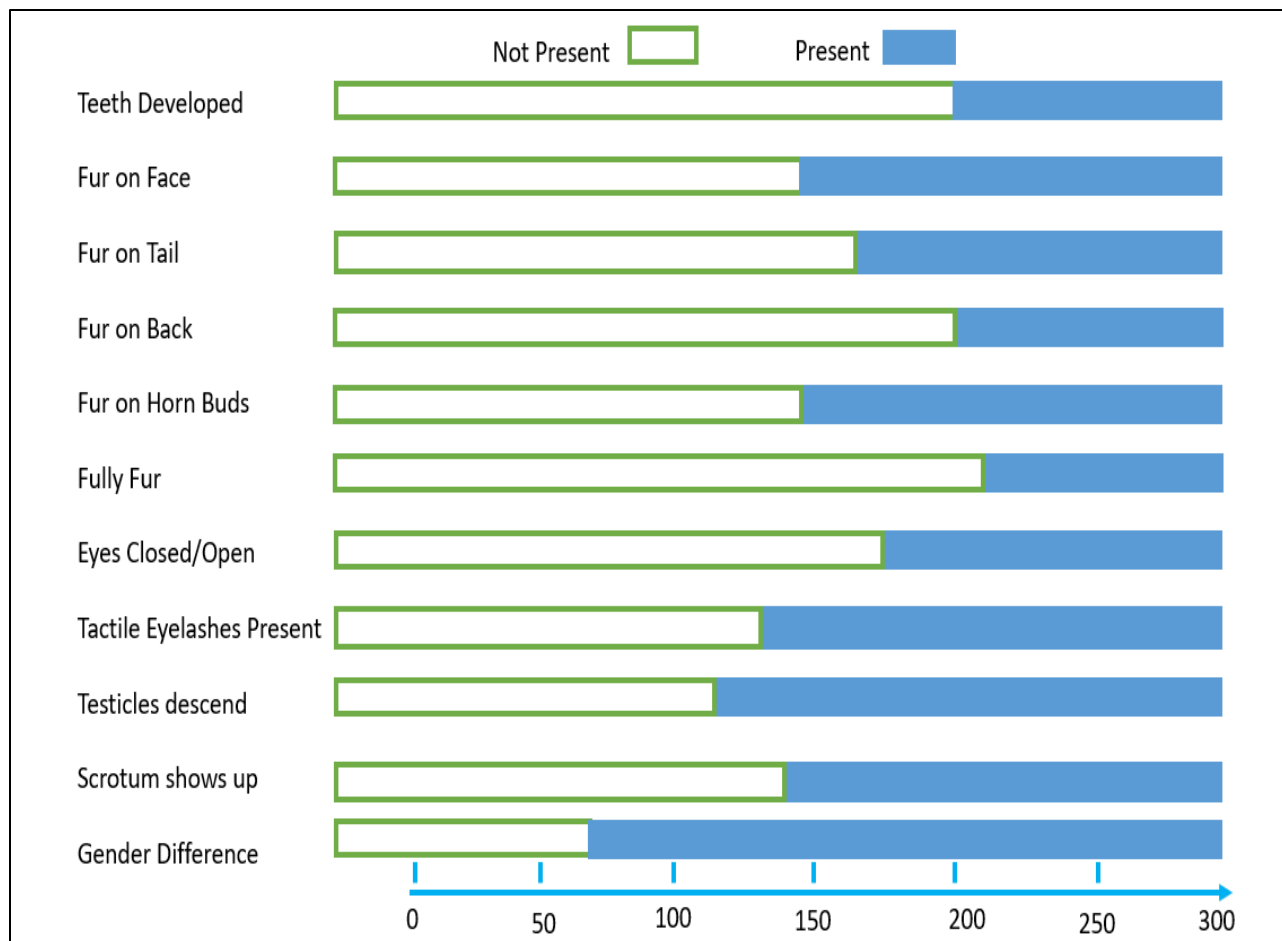
8th Month of Development

- The eight month is between 210-240 days of the pregnancy
- The animal's _____ and the edges of the ears start to gain a lot of hair
- Toward the end of the month, the calf will have almost a _____ of hair
- At the end of this month, the calf should be between 27-30 inches in length

9th Month of Development

- The ninth month is between 240-270 days of the pregnancy
- On average, a calf will be born between day _____ - _____ days, commonly many breeds are around 283 for an average
- At this stage, the calf will have developed and all _____ will be visible and present
- On average a calf will be between 60-90 lbs. when born

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Growth Stages of a Fetal Calf Notes – Answer Key

Follow the Growth Stages of a Fetal Calf presentation slides, fill in the blanks as you go through the presentation slides.

Bovine Heat Cycle

- The average heat for a bovine on average is between **15-18** hours of time
- In comparison to other animals, this is a short time of heat (less than **1** day in heat)
- If doing artificial insemination, it is important to do checks before inseminating to make sure that the bovine is ready to be breed

Estrus – Time in Heat

- Canine: **2-4** weeks
- Feline: **1-7** days
- Bovine: **15-18** hours
- Equine: **5-7** days
- Porcine: **2-3** days

Reproductive Cycle Times

<u>Animal</u>	<u>Estrous Cycle</u>	<u>Gestation</u>
Canine	6-12 months	2 months
Equine	19-21 days	11 months
Feline	14-21 days	2 months
Porcine	19-21 days	3 m/3w/3d
Bovine	19-21 days	9 months

Basic Reproduction Terms

- **Puberty:** sexual maturity
- **Ovulation:** release of ovum (**egg**) from ovary
- **Copulation:** the act of mating
- **Fertilization:** union of male and female sex cells
- **Conception:** becoming **pregnant**

Basic Reproductive Terms

- **Estrus:** the time of receptivity to mating during the estrous cycle – also known as "**heat**"
- **Estrous Cycle:** the interval between two estrus periods
- **Gestation:** **pregnancy**
- **Parturition:** the act of giving **birth**

Corpus Luteum

- The main purpose of the corpus luteum is to help support pregnancy in mammals
- There are three stages that a corpus luteum goes through:

Corpus luteum 1 (**CL1**)

Corpus luteum 2 (**CL2**)

Corpus luteum 3 (**CL3**)

Corpus Luteum (cont.)

- This reproductive gland helps to produce progesterone
- **Progesterone** is required to establish a pregnancy
- CLs also are important to maintain a pregnancy once pregnant

1st month of Development

- The first month is between 0-30 days of pregnancy
- The fetus at one month is no larger than a **pea**
- In many cases, you might not be able to feel/palpate it due to being so small
- You may be able to feel **fluid** more around day 28 than the fetus itself

2nd month of Development

- The second month is between 30-60 days of pregnancy
- In early palpation it is important to be very gentle as to not damage a pregnancy due to **rough** handling
- At two months you will start to be able to feel the fetus as it is around the size of a **mouse**

3rd month of Development

- The third month is between 60-90 days of pregnancy
- Toward the end of this month, the four compartments of the **ruminant** will start to be formed and recognized
- The fetus will measure about 14 cm in length
- For the male, the **scrotum** will start to become visible

4th month of Development

- The fourth month is between 90-120 days of pregnancy
- In this month, the fetus's hooves become distinct, firm, will be a **yellowish** color, and will no longer be transparent but more of a solid color
- The fetus can weigh up to about 4-4.5 lbs. and between **9-11** inches in length

5th month of Development

- The fifth month is between 120-150 days of pregnancy
- In the beginning of the month, the first tactile **hairs** start to form on the lips, chin, and upper eyelid of the fetal calf
- The calf's teats are now visible on the animal
- For a male fetal calf, the testicles have now moved into the scrotum
- The fetus is about **5.5** lbs. and about 13-14 inches in length

6th month of Development

- The sixth month is between 150-180 days of pregnancy
- The **eyelashes** are now more developed, and the facial features are becoming more pronounced
- The remainder of the fetus's body is still lacks hair
- The fetus is about **18-20** inches long

7th month of Development

- The seventh month is between 180-210 days of pregnancy
- Hair starts to appear other places on the body, besides the facial area
- You can start seeing hair start on the **tail** and on the area around the **horns**
- The fetus runs about 23-24 inches in length at this stage

8th month of Development

- The eight month is between 210-240 days of the pregnancy
- The animal's **back** and the edges of the ears start to gain a lot of hair
- Toward the end of the month, the calf will have almost a **full coat** of hair
- At the end of this month, the calf should be between 27-30 inches in length

9th month of Development

- The ninth month is between 240-270 days of the pregnancy
- On average, a calf will be born between day **265-295** days, commonly many breeds are around 283 for an average
- At this stage, the calf will have developed and all **teeth** will be visible and present
- On average a calf will be between 60 -90 lbs. when born

Lesson One – Growth Stages of a Fetal Calf

REVIEW: Development Stages

10 minutes

Purpose:

Participants will work in groups to complete a puzzle, testing their knowledge of the bovine male and female reproductive systems.

Materials:

- Pen or pencil
- *Development Stages Chart*
- *Development Stages Chart – Answer Key*
- Bovine Fetal Development Models

Facilitation Steps:

1. After the slide presentation, hand out the *Development Stages Chart* worksheet.
2. Have participants work on this individually, in pairs, or in groups.
3. Participants should use their notes to help them as they go over the *Development Stages Chart*.
4. Allow participants to also use the Bovine Fetal Development Models if needed.
5. This is an assessment that you can correct in class or have participants hand in if you are interested in a formal assessment.

Name: _____ Class: _____

Development Stages Chart

For each section, fill in 2-3 different Development Features and one Comparison Animal/Object Size taken from your notes, class discussion, and/or observations made on the Bovine Fetal Development Models.

Month:	Development Features:	Comparison Animal/Object Size
Month 1	- Not able to feel much - May be able to palpate fluid	- Pea size
Month 2		
Month 3		
Month 4		
Month 5		
Month 6		
Month 7		

Development Stages Chart – Answer Key

For each section, fill in 2-3 different Development Features and one Comparison Animal/Object Size taken from your notes, class discussion, and/or observations made on the Bovine Fetal Development Models.

Month:	Development Features:	Comparison Animal/Object Size
Month 1	- Not able to feel much - May be able to palpate fluid	- Pea size
Month 2	- Can feel the fetus at this point - Around 3-4 inches in length	- Mouse
Month 3	- Ruminant will start to become formed - 5-6 inches in length - Male scrotum is becoming visible	- Rat
Month 4	- Hooves become distinct - Hooves become a yellow color - Hooves become solid - Around 4-4.5 lbs. in weight - Around 9-10 inches in length	- Small Cat
Month 5	- Hairs start to form on lips, chin, eyelids - Teats of calf become visible - Testicles move to the scrotum - Fetus size is about 5.5 lbs. - About 13-14 inches in length	- Large Cat
Month 6	- Eyelashes are becoming developed - Facial features are showing up - Lack of hair on the rest of the body - Fetus is about 18-20 inches long	- Small Dog
Month 7	- Hair shows up in other places on the animal - Hair starts to show up on the tail - Fetus is about 23-24 inches in length	- Large Dog