4-H Animal Science Lesson Plan
Quality Assurance
Level 3

Title:
    Artificial Insemination – AI

Area:
    Reproduction

Goal (Learning Objective):
Participants will learn why artificial insemination (AI) is used in livestock production, the tools and procedures used and the benefits to producers.

Supplies Needed:
Pictures of AI tools
AI terminology and definitions
Pictures of female anatomy for beef, swine, sheep and goats
Flip chart paper and markers
Beef Artificial Insemination -   https://www.youtube.com/watch?v=stvnGYcKz60
Swine Artificial Insemination – https://www.youtube.com/watch?v=yjY0gl1KUvo&feature=youtu.be
                                                    https://www.youtube.com/watch?v=hjPPAXck_l4
Sheep Artificial Insemination - https://www.youtube.com/watch?v=7crTjxw28J0
Goat Artificial Insemination - https://www.youtube.com/watch?v=BiXFbC8T6n0&feature=youtu.be
Computer and Internet
Assign a youth to share pros and cons of using AI on the species they are raising

Pre-Lesson Preparation:
Artificial insemination (AI) is the practice of the introduction of sperm into the reproductive tract of the female other than by natural mating. AI allows for the collection of semen from a superior male and placing it into the reproductive tract of a female at the proper time. Semen is collected from the male and is usually frozen. Many straws of semen can be filled from one collection. A small amount of semen is frozen into a plastic straw, then thawed and placed into the female reproductive tract using the proper tools at the end of her standing heat.
Beef – AI provided a great advancement in the beef industry because it can genetically improve livestock due to accessibility of quality males. The breeding females must be inseminated at the proper time in their breeding cycle. The general procedure for AI breeding is to follow the AM/PM rule. If the cow shows signs of standing heat at night, breed her the next morning. If she shows signs of heat in the morning, breed her that night.

Swine – sows and gilts should be bred 12 to 24 hours after they show standing heat (gilts are to be bred earlier than sows). A second insemination should follow 12 to 24 hours after the first insemination with gilts again on the earlier schedule.

Sheep - AI is not a common practice in the sheep industry because ewes have a more complex cervix to pass, which requires more advanced AI equipment and there is difficulty in preserving or extending fresh ram semen. Ram semen doesn't freeze as well as other species and fresh semen has proven difficult to extend past 24 hours.

Goat – Females can be inseminated with either fresh or frozen semen from 12 to 18 hours after the onset of heat. Semen from the goat can be processed (extended) and used within 48 hours or frozen into plastic straws for later use.

Lesson Directions/Outline:
- <u>Background information</u>
- For swine the AI tool is the AI rod, there are not a lot of other tools or supplies needed.
    For cattle, beside the AI rod there is a straw cutter, insemination sheaths, a thawing thermos with a thermometer, and tweezers to remove semen straws from nitrogen tank. Explain the difference between how swine semen is deposited versus cattle semen (swine semen is typically in a squeeze bottle or bag) and not frozen but rather kept at room temp while bull semen is kept frozen prior to use, put into thawing bath then deposited).

    - Review the general benefits of using AI:
        - Increases the ability to use outstanding sires. Top sires are accessible to all producers.
        - Using sire summaries for beef, boar summaries for swine, ram summaries for sheep and buck summaries for goat, as well as EPD's can help a producer know more about the male before adding the genetics to the herd.
        - Improved genetics because of the ability to use superior males, as well as access to genetics from different geographical areas.
        - Increases uniformity of the offspring because many females can have offspring from the same male.
        - Helps control reproductive diseases because the male is not in physical contact with the female.
        - Reduced need of males because many females can be AI bred.
        - Management convenience because you can control when the females are bred using reproductive synchronization. Many females can be made ready to breed at the same time using synchronization practices allowing for offspring to be born in the same time frame.
    - Challenges of using AI:
        - The biggest challenge of AI is timing correctly with each female of each species to better increase rate of conception. This also requires knowledge of the signs of heat for each species.
        - AI is not a 100% guarantee of conception, which may still require a natural service.
        - More time consuming and labor intensive compared to natural service.
        - The process of AI can be step sensitive to avoid degradation of semen.
        - Storage of semen must be done correctly for each species to ensure it remains viable for use.

- <u>Conducting the activity (Complete them based on the knowledge level of club members)</u>
- Ask if any of the youth or parents want to share experiences using AI.
- Have the previously assigned youth discuss pros and cons of using AI for the species they are raising.
- Write a paragraph describing why or why not use AI?
- Review the pictures of the tools and tool definition with the youth.

- If possible, watch the video that pertains to the species of the club members you are leading and discuss.
- Have the youth match the picture to the correct species, tool name and definition.

- <u>What did we learn?</u>
- Ask: What are some benefits of utilizing this technology?
- Ask: What species benefit the most from using AI?

- <u>Why is that important?</u>
  Ask: How can these benefits help with advancements in the industry?
  Ask: Why is controlling disease a benefit from using AI?

References/Resources:

Ohio State University Extension. (2000). Swine Resource Handbook for Market and Breeding Projects, (page 18-4 through 18-6).,
             Extension
Ohio State University Extension. (2011). Beef Resource Handbook Reproduction and Genetics. 6-4 through 6-6.,
Ohio State University Extension. (2000). Sheep Resource Handbook for Market and Breeding Projects. (page 123).
Ohio State University Extension. (2008). Reproduction. Goat Resource Handbook (page 40).
Ohio State University Extension. (2004). Reproduction. Dairy Resource Handbook (page 29).

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Swine Artificial Insemination – https://www.youtube.com/watch?v=yjY0gl1KUvo&feature=youtu.be
             https://www.youtube.com/watch?v=hjPPAXck_l4
Sheep Artificial Insemination - https://www.youtube.com/watch?v=7crTjxw28J0
Goat Artificial Insemination - https://www.youtube.com/watch?v=BiXFbC8T6n0&feature=youtu.be

Tools
AI Gun
QuickLock AI Gun
AI Gun Sheath
Tweezers
Straw Cutter
AI Lube
Thawing Thermos
Semen Straw
Sponge Tip AI Rod/Catheter
Spiral Tip AI Rod/Catheter
Semen Squeeze Bottle
Insemination Endoscope
Catheters
AI Gloves/Sleeves -

Definitions
AI Gun - The tool used to place the semen in the cervix of the female once it has been loaded.
QuickLock AI Gun – tool used to AI sheep and goats once the semen has been loaded.
AI Gun Sheath - Used to cover the AI Gun to keep it clean and protect the female from the edges of the gun.
Tweezers - Used to grab the frozen semen straw from the tank. And then put in the thawing thermos.
Straw Cutter - The tool to cut the semen straw tip before loading it in the gun.
AI Lube - A solution to use on the AI glove as a lubricant to allow the technician to enter the cow with his arm.
Thawing Thermos - A liquid container used to heat water to the proper temperature to thaw the semen.
Semen straw - A small sleeve or straw that semen is place in and then frozen. It must be thawed before placing in the female.
Sponge Tip AI Rod/Catheter - A rod a sponge tip used to inseminate a sow or a gilt.

Spiral Tip AI Rod/ Catheter - A rod with a spiral tip used in swine insemination.
Semen Squeeze Bottle - A bottle filled with semen that attaches to the rod/catheter used in swine insemination.
Insemination Endoscope - A stainless steel, handheld cannula with a light that is inserted in the vagina to determine placement of the semen.
Cannula - A small tube used for insertion into a body cavity or duct.
Catheter - A thin tube that is put into the vulva of the female to inject the semen into her reproductive tract (cervix).
AI Gloves/Sleeves – A plastic glove usually arm length, worn by the AI technician to allow for easy entry in the cow rectum and to keep the process as clean as possible.

AI Tool	Species Used For			
AI Gun	Beef	Sheep	Goats	
AI Gun Sheath	Beef			
Tweezers	Beef		Goats	
Straw Cutter	Beef		Goats	
AI Lube	Beef	Sheep	Goats	Swine
Thawing Thermos	Beef			
Semen Straw	Beef	Sheep	Goats	
Sponge Tip Rod/Catheter				Swine
Spiral Tip Rod/Catheter				Swine
Semen Squeeze Bottle				Swine
Insemination Endoscope		Sheep	Goats	
Stainless Steel Cannula		Sheep	Goats	
QuickLock AI Gun		Sheep	Goats	
Catheter		Sheep	Goats	Swine
AI Gloves/Sleeves	Beef			