

Livestock Injection Methods & Placement



Skill Level:

- ▶ Intermediate to advanced

Life Skills:

- ▶ Communication, critical thinking and decision making

Setting:

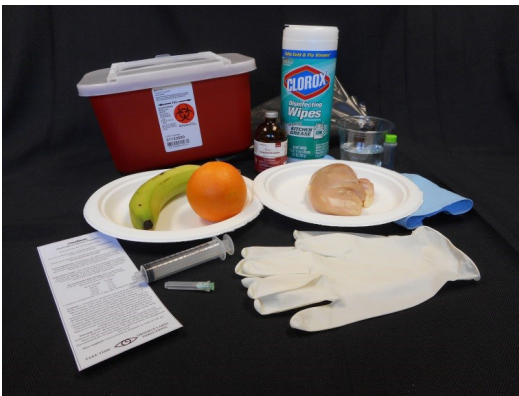
- ▶ An outdoor or indoor space with a supply station, tables and an easy-to-clean floor; seating is optional

Time:

- ▶ 20–25 minutes

Materials:

- Flipchart or other large paper
- Markers
- Pens or pencils (one per participant)
- Easel or display space
- Disinfectant wipes or spray
- Disposable latex or nitrile gloves (one pair per person) (**Note:** Be sure to provide gloves of various sizes, and if anyone in the group is allergic to latex, provide nitrile gloves.)
- Sharps container, either commercial or homemade (a labeled, puncture-proof container with a lid, duct-taped closed when done with the activity)
- Duct tape
- Permanent marker
- Trash bag (one or more, depending on the size of your group)
- “Injection Kits” (one per person or team, plus one demonstration kit):
 - ▶ New medical syringe and 16- to 21-gauge needle. (**Note:** 18-gauge needles and syringes that come with the needles attached and that are designed for one-time use are recommended.)
 - ▶ Disposable dinner plates (one per kit)
 - ▶ 8-ounce disposable cups (one per kit)
 - ▶ Injectable solution: about 3 ounces of water and about 30 drops (a little more than 1/3 teaspoon) of blue or green food coloring per kit
- ▶ Paper towels (at least one sheet per participant)
- ▶ One of the following per person: about 3 ounces of chicken breast meat (with or without skin), an unpeeled yellow (not green) banana, an unpeeled orange
- ▶ Metric ruler (one per kit, optional)
- “Injection Methods and Procedures” handout (one per participant)
- “Sample Veterinary Medication Label” handout OR the actual label from a veterinary medication bottle that is empty and has been thoroughly rinsed (one per participant, optional)
- “Reading a Veterinary Medication Label Worksheet” (one per participant, optional)
- “Michigan 4-H Animal Treatment Record Sheet” (one per participant, optional)



Overview:

The Livestock Injection Methods and Placement lesson is designed to add a visual and hands-on component to an important topic for understanding the different types of injection methods used in livestock management. As a team, participants will discuss and identify important components of each injection method and be able to know where and how to give each injection type on various livestock and practice the hands-on method of giving an injection.

Objectives:

After completing this activity, participants will be able to:

- ▶ Discuss and identify five injection methods and where on an animal's body the injections are typically given.
- ▶ Describe why injections are given using different methods and in different places on an animal's body.
- ▶ Demonstrate how to give two different types of injections (intramuscular or IM and subcutaneous or SC).
- ▶ Explain why some veterinary medications are delivered by injection.
- ▶ Read and identify six things from an injectable veterinary medication label: the name of the medication, why it's used, the proper dosage, the injection method to use, whether the medication has a withdrawal time and what it is, the medication's expiration date.

PROCEDURE:

Before the meeting:

1. Review the lesson and gather any supplies you will need.
2. Recruit at least one adult or older teen volunteer who is experienced at giving injections for every two pairs of participants. Give the helpers a copy of the lesson and encourage them to review it before the meeting, paying close attention to the safety information and the photos showing the proper techniques for each injection method.
3. Use the information in Table 1 to decide whether to have the participants practice giving intramuscular (IM) and subcutaneous (SC or SQ) injections on chicken breast meat (with or without skin), yellow bananas, unpeeled oranges, or some combination.
4. Use the supplies from the materials list to prepare one Injection Kit for each participant or team and one for you to use in demonstrating the injection methods to the group. Place one practice injection subject (chicken breast meat, yellow banana or unpeeled orange), one syringe and needle combination, and at least one sheet of paper towel per team member on each plate. If the needles and syringes you'll be using are packaged separately, put a needle (with the cap still on) on each syringe. Prepare the injection solution by filling disposable cups about one-third full of water. Add enough blue or green food coloring (about 30 drops or 1/3 teaspoon) to make the solution deep blue or green.
5. Set the completed kits, the injection solution and the disposable gloves on a table or container near the front of the meeting space. (**Note:** You may want to assign someone to watch over the plates containing the needle-syringe combinations before the meeting starts.)
6. Recreate the structure and headers only (no data) of Table 2 on flipchart paper. (**Note:** If you have a large group or the teams will be spread out over a large area as they work, you may want to make and display several large copies of the blank table around the room. If you do this, have volunteers fill out the other flipcharts at the same time you're working on the one at the front of the room.)
7. Buy or make a sharps container from an empty, rinsed out, puncture-proof container with a lid, such as a laundry detergent jug or a coffee can. Label both sides of the container with "Danger – Medical Sharps Disposal Container" in permanent marker.
8. Make one copy per participant of the following handouts and worksheets:
 - "Injection Methods and Procedures" worksheet
 - "Reading a Veterinary Medication Label" handout (optional) (**Note:** You could also have participants inspect the labels of clean, empty bottles of injectable animal medications for this activity.)
 - "Veterinary Medication Label Worksheet" (optional)
9. Meet with the helpers you recruited before the meeting starts. Explain that their primary responsibility during the lesson will be to keep the

Table 1. Choosing Model Patients for Intramuscular (IM) and Subcutaneous (SC or SQ) Injections

Potential model patient	Suitability as model for intramuscular (IM) injections	Suitability as model for subcutaneous (SC or SQ) injections
Chicken breast meat (skinless)	Most realistic option because it mimics the texture participants will encounter when injecting live animals, but it's also the most expensive.	Poor option because there is no skin to inject solution under and it's expensive.
Chicken breast meat (with skin)	Most realistic option because it mimics the texture participants will encounter when injecting live animals, but it's also the most expensive.	Most realistic option because it mimics injecting an animal. Can also be challenging because the skin is thin.
Yellow banana	Usable option, but hard to see injection results without peeling away the skin.	Good option because the skin is thick. Can be more challenging to inject into the skin because the skin is more densely packed than the skin of other options.
Unpeeled orange	Usable option, but hard to see injection results without peeling away the skin.	Best option because the skin is thick and there are large air pockets between the skin and the flesh of the fruit.

participants – and themselves – safe. This means, among other things:

- Keeping track of the needles and syringes the participants in their group are using at all times.
- Monitoring the participants in the group to ensure that they're handling the needles and syringes safely.
- Helping with cleanup after the injection activity to make sure the needles and syringes are collected and disposed of properly in the sharps container.

(Note: If you plan to have your group work on the medication label inspection part of the lesson, tell the helpers that you may need them to check the participants' completed "Reading a Veterinary Medication Label Worksheets," too.)

During the meeting:

Important Safety Note

It's vital that you discuss safe handling of syringes, needles and medication (and livestock!) with the group before passing out any part of the Injection Kits. Further, we recommend distributing the syringes and needles only after everyone is ready for that part of the activity. Bored or restless participants may play with any supplies within reach, potentially missing the safety discussion and thereby creating a dangerous situation.

1. Introduce the activity by reading aloud or paraphrasing the following:

Today we're going to talk about injecting medications into livestock. We'll cover why we deliver some medications by injection rather than in the animal's feed or water, how and why different injection methods are used for different conditions, and the safety issues related to giving injections. Then you'll practice giving two kinds of injections: intramuscular or IM and subcutaneous or SC.

2. If you're going to have the group do the label reading activity, explain that they'll also learn how to read a medication label and what to do if the label on an injectable medication doesn't specify the injection method or site to use.

3. Next, ask the group the following questions. You may want to record their answers on flipchart paper and display the sheet where everyone can read it.
 - ▶ What are the two basic reasons for delivering medication to an animal by injection?
 - *To prevent a healthy animal from developing the diseases it's being vaccinated against (and to keep it from developing complications from those diseases).*
 - *To treat a sick or injured animal.*
 - ▶ Why are some medications delivered by injection rather than in an animal's feed or water?
 - *So that the livestock producer knows for sure that the animal has actually received a set dose of medication, rather than relying on the chance that it will get some or all of a dose from its feed or water.*
 - *Because sick animals often "go off feed," that is, they don't eat or drink much or at all. If they're not eating or drinking, they won't get any of the medication that has been put into their feed or water.*

4. Now read aloud or paraphrase the following:

Animal injection methods aren't that different from human injection methods. We all have muscles, veins and layers of skin, which are all useful places to inject various medications.

It wouldn't be practical – or fair to the animal – for all of us to practice giving injections to the same steer, lamb or hog at one meeting. So we're going to learn about and practice giving injections to model patients – [chicken breast meat/yellow bananas/unpeeled oranges] – instead of live animals.

5. Now ask for volunteers to name one injection method or place on an animal's body where we give injections. You may want to record their answers on flipchart paper and display the paper where everyone can see it. Note that it's okay if the participants don't know the scientific names for the injection methods. In this case, "under the skin" is as good as "subcutaneous." The group may stall

Table 2. Common methods of giving animals injections

Injection Method	Common Abbreviation	Injection Placement
Oral	PO, per-os	In the mouth
Insufflation	Not commonly abbreviated	Through the nose into the nasal passage
Intravenous	IV	Into the bloodstream through a vein
Subcutaneous	SC or SQ	Under the skin
Intramuscular	IM	Into a muscle

Table 3. Less common methods of giving animals injections

Injection Method	Common Abbreviation	Injection Placement
Gavagel	None	Into the stomach via a tube inserted into the mouth and commonly used to release bloat or feed a newborn animal colostrum
Rectal	Per rectum	Into the rectum via the anus
Intraperitoneal	IP	Into the abdominal cavity
Intradermal	ID	Into or between layers of skin (such as in the eyelid using a small gauge needle)
Intrathecal	IT	Into the subarachnoid space (area where large blood vessels are located) of the spinal cord
Intracranial	IC	Into the brain

out after naming the three most common methods: intramuscular (into a muscle), intravenous (into a vein) and subcutaneous (under the skin). If they do, walk them through the information about common injection methods in Table 2. If you have an older or more experienced group, you may also want to review Table 3 with them. If you do decide to cover Table 3, explain that these injections are more likely to be given by a licensed veterinarian than by a lay person such as a 4-H volunteer, member, or parent, or by a commercial producer.

6. Next, read aloud or paraphrase the following:

Now that we've discussed various injection methods, let's look at the reasons for choosing a particular injection method and injection site.

7. Ask the participants the following questions. You may want to write their answers on flipchart paper and display the sheet where everyone can see it.

- ▶ Why is it important to identify the best injection method to use and the best place on the animal to inject a particular medication?
 - *To safely deliver the correct dose of medicine to the spot in the animal's system where it will be the most effective.*

- *To give the animal the best care possible.*
- *To avoid harming the animal.*
- *To obey the laws related to animal well-being and ensuring a safe food supply.*
- *To avoid damaging the tissues of the animal. (This is particularly important for market animals.)*
- ▶ Injection sites sometimes develop small blemishes, or even scar tissue. So where on an animal are the best spots to give an injection, and why? Would the type of animal – valued for its meat, fur or wool, riding, or physical beauty – make a difference?
 - *Market animals should be given injections in the neck region to avoid damaging tissue that will eventually become a meat cut, because such damage would decrease the meat's value. (Note: If someone suggests giving injections in a market animal's rear end, point out that the rear end is the source of some of the most valuable meat cuts, and therefore should be avoided as an injection site if at all possible.)*
 - *Young animals can be given injections in the neck region or in the loose flaps of skin in the flank or behind the elbow. Explain that one exception to this is that foals [very young horses], should be given injections in the buttock or high hip to avoid causing neck pain, which could discourage them from nursing. (Foals have to turn their heads quite*

a bit when nursing, so neck pain is a serious matter for them.)

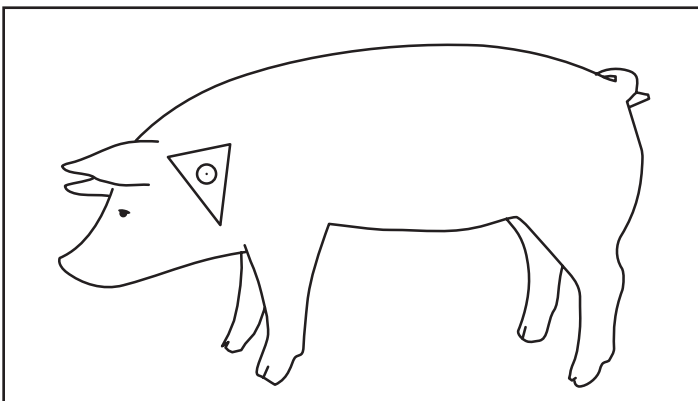
8. Read aloud or paraphrase the following:

Depending on the age, species and physical size of the animal that needs an injection, the best site for that injection can be rather small. To help you visualize the size of an injection site (see fig. 1), I'd like you to follow along with the movements I'm going to describe and demonstrate. First, touch the tips of your index fingers together pointing toward the ground. Next, touch the tips of your thumbs together (with the thumbs parallel to the ground) and form a triangle. You should now be looking at a triangle that is resting on one point.

This triangle is the size of the area on most young animals' necks where you can safely inject most medications. In older or larger animals, you can expand your triangle to grow with the animal.

Some medications have limits on how much can be injected per site. For example, there is a 10 ml per injection site limit on the antibiotic Oxytetracycline, and some animals are big enough that the dose they need has to be split among six or more injection sites. Veterinarians also recommend limiting the number of injections to three per side of the neck, and spacing the injections a hand-width apart, so administering a full dose can be

Figure 1. Relative size and location of an appropriate injection site on a pig.



a challenge. Smaller animals will require smaller doses of most medications, so even though they have less room on their necks to give injections, there tends to be less of a problem fitting in full doses.

9. Now ask the participants the following questions:

- ▶ What problems could be caused by miscalculating a dose, or accidentally drawing too much medication into a syringe and therefore injecting too much of a drug into an animal?
 - The animal could suffer muscle and tissue damage.
 - The amount of medication residue could increase, which would in turn increase the withdrawal period.
 - The injection site could become irritated, causing the animal to rub and possibly injure the site.
 - The person who gave the injection could be prosecuted for breaking the law unless he or she was acting on a veterinarian's instructions to give an animal more of a medication than what is stated on the label.
 - The animal could become sicker than it was before it received the medication.
 - The animal could have a metabolic reaction and go off feed.
 - The animal could die if overdosed with medication.
- ▶ What problems could be caused by injecting too little of a medication into an animal?
 - The animal could become sicker.
 - If the medication is an antibiotic, the organism causing the disease could become resistant to it.
 - If the medication is a vaccine, the animal could fail to develop full immunity to the disease the vaccination was intended to prevent, which could in turn cause the animal to develop the disease if exposed to it. It could also ultimately result in lower herd immunity.

10. Introduce the models being used for injection by reading aloud or paraphrasing the following:

As I mentioned earlier, today we will be using [chicken breast meat/bananas/oranges] to act as our animal models or stand-ins to practice giving injections on. We'll start off by practicing an intramuscular, or IM, injection.

11. Divide the group into pairs, but don't pass out any supplies yet. Read aloud or paraphrase the safety discussion that follows. You may want to paraphrase each safety point on flipchart paper as you talk about it, and display the sheet where everyone can see it.

Before I walk you through how to give an IM injection, we have to talk about safety. This is just a practice session today, but you need to know how to protect yourself and your project animals if you ever have to give them injections. So pay attention to this!

Working With Animals

One of the big differences between practicing giving injections on a hunk of meat or a piece of fruit and injecting a live animal with medication is that the objects we're injecting today won't move when being poked with a needle. Live animals will most likely move, sometimes forcefully. So to help keep yourself and the animal safe, follow these directions:

- Clear away any equipment or other loose objects that could cause harm to you or the animal.***
- Safely tie or confine the animal somewhere away from other animals before giving it an injection.***
- Work calmly and quietly while working with the animal.***
- Stay alert and keep one eye on the animal before, while and after giving the injection.***
- Continue to monitor any animal that has been given medication for possible reactions.***

Working With Needles, Syringes and Medications Today

- Respect the importance of learning how to give injections safely.***
- You will be working with actual needles to gain experience today. When you're not using the needle and syringe, carefully place the system on a flat surface.***

c. If any of the helpers tell you to stop what you're doing, please freeze and be quiet so you can hear further instructions.

d. Anyone who fails to follow these guidelines will be asked to sit out the rest of the activity.

12. Ask the group if they have any questions or anything to add to the discussion. After you've answered their questions, ask them to watch carefully as you demonstrate how to fill a syringe and give an IM injection. Then read aloud or paraphrase the following script as you do each step:

Before you begin, please focus your attention this way and I will demonstrate the steps you'll follow to give an IM injection of 2 ml of colored water solution that's standing in for medication to a [chicken breast/orange/banana] that's standing in for an animal. You'll collect a syringe and needle, the colored water solution, and [chicken breast/orange/banana]. Next you'll put on a pair of medical exam gloves.

Step 1 – Filling the syringe.

For both IM and SC injections, the steps for filling the syringe are the same. To do this, remove the cap from the needle. Place the tip of the needle completely under the surface of the water solution and carefully fill the syringe to the 2 ml mark by slowly pulling the plunger (handle) up. When you've done that, you pull the needle out of the water and hold the syringe so the needle is pointing up. Make sure that you do not have any extra air in the syringe. To ensure this, tap syringe with a finger to move air up toward needle then carefully expelling air if needed. You may need to draw up more solution to get the correct amount for injection after any air is removed. Next you'll check the amount of medicine in the syringe to make sure it's still at 2 ml. If it isn't you'll repeat the filling process until you have 2 ml of solution and no air bubbles in the syringe.

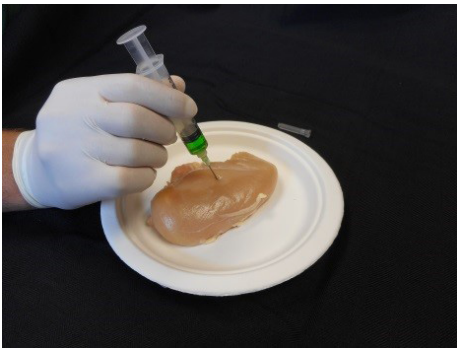


Figure 2. Hold the needle about perpendicular to the surface of the model when placing an intramuscular (IM) injection.

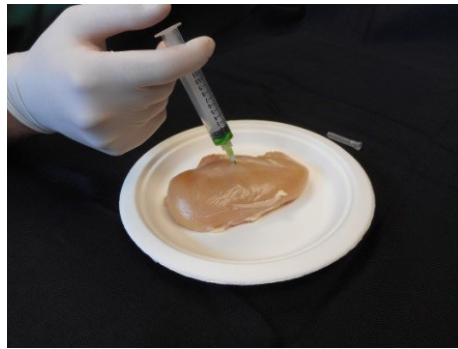


Figure 3: Depressing the plunger to administer an intramuscular (IM) injection. Be sure to keep the needle about perpendicular to the surface of the model.

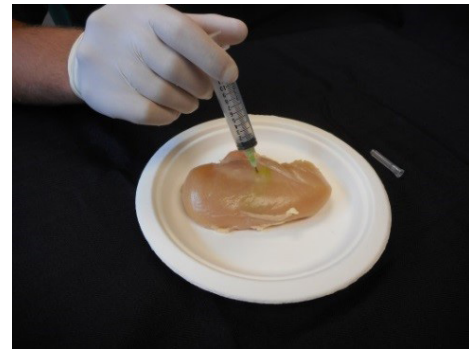


Figure 4. The muscle fiber of the model shows discoloration from the injection solution immediately after the intramuscular (IM) injection has been given.

Step 2a – Giving an Intramuscular (IM) injection.

Once your syringe is loaded, carefully insert the needle into the center of the [chicken breast/orange/banana] perpendicular to the model (see fig. 2). Slowly force the needle through the flesh, leaving about 1 cm of the needle showing.

[**Note:** If you included a metric ruler in the Injection Kits, instruct anyone who is unsure of how long a centimeter is to use the ruler as a gauge.]

Carefully pull back the plunger a tiny bit (less than 0.5 ml) to make sure you aren't collecting liquid from the model. (The liquid would be blood if you were working on a live animal.) If liquid does enter the syringe after you pull back the plunger, remove the needle and try a new injection site. If there's no liquid from the model, go ahead with the injection by slowly pressing the plunger until the syringe is empty (see fig. 3).

[**Note:** If your group is working with chicken breast meat, point out that they'll probably be able to faintly see the water solution spreading into the muscle fibers (see fig. 4). If they're injecting the solution into a piece of fruit, the spread of the solution will be fainter because of the peel.]

Now that you have properly performed an Intramuscular (IM) injection, slowly remove the syringe from the model.

[**Note:** If your group is using oranges, tell participants they may see some water solution drip out.]

Carefully place the syringe on a flat surface with the needle facing away from you and your partner.

Step 2b – Giving a Subcutaneous (SC) injection.

To give a subcutaneous injection, you'll follow the same procedure you did before for filling the syringe with 2 ml of colored water.

Once your syringe is loaded, carefully insert the needle at a very shallow angle (approximately a 15 degree angle) so that it's lying almost flat against the surface of the model (see fig 5). Slowly force the needle into the skin, leaving about 1 cm of needle showing, and making sure you don't push beyond the peel into the flesh of the fruit.



Figure 5. Hold the needle at about a 15-degree angle to the surface of the model when placing a subcutaneous (SC) injection.

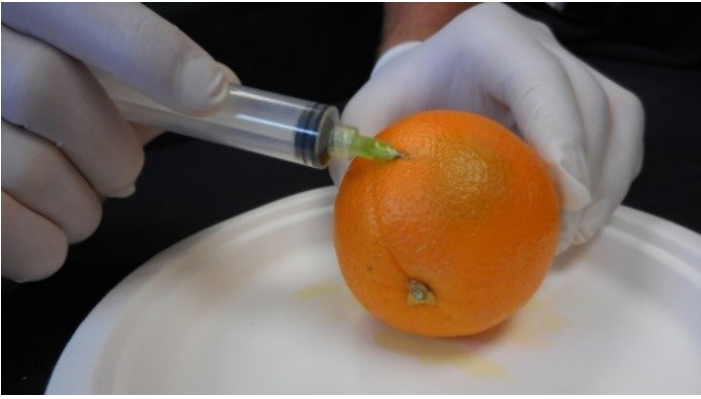


Figure 6. Depressing the plunger to administer a subcutaneous (SC) injection. Be sure to keep the needle at about a 15-degree angle to the surface of the model. Note the food coloring already visible in the skin layer.

When the needle is in place, carefully pull back the plunger – no more than 0.5 ml – to make sure you aren’t collecting any liquid from the model. (Remember that this liquid would be blood if you were giving a live animal an injection.) If liquid from the model has entered the syringe, pull out the needle and move to a new injection site. If there’s no liquid from the model in the syringe, go ahead with the injection by slowly pressing the plunger until the syringe is empty. You will notice the food coloring (see fig. 6) spreading under the skin layer.

Then slowly remove the needle from the model. Set the needle and the syringe back on the plate with the needle facing away from you and your partner.

And that’s how you give a model an SC injection. The biggest difference between giving an SC injection to a model and to a live animal is that when injecting most animals, you would lift the hide slightly with your hand to create a small pocket for the injection.

13. Now have the volunteer helpers collect one Injection Kit for every pair of participants they’re working with, and take it back to their group. Remind the volunteers that they should be aware of where the syringes and needles are and help ensure that participants are working safely.

14. Read aloud or paraphrase the following:

Once you have your supplies and are ready to begin, go ahead and start injecting your models, one person at a time. Make sure to be very careful with the needles and syringes. Each of you will give one intramuscular and one subcutaneous injection. If you don’t remember exactly how to do a step, ask your group’s volunteer helper or me for advice.

15. Move around the room while the participants work, answering questions and giving advice as needed. Once participants have completed their two injections, inform them that they may now perform more practice injections if they wish.

16. Have a volunteer ready to walk around the stations to collect all syringes and needles, placing them in the labeled sharps container (caps don’t need to be placed on the needles). When you need to move on, draw their attention back to you, then read aloud or paraphrase the following:

Please place your syringe and needle back on your plate with the needle facing away from you and your partner. A volunteer will be coming around to collect your syringe and needle. It’s time to inspect your models to see how well your injections worked.

17. Continue reading or paraphrasing, choosing the appropriate paragraph depending on whether you’ve used chicken breast or fruit models in the activity.

▶ ***Intramuscular injection on chicken breast*** – *If you placed the IM injection correctly, you should be able to see that the injected material easily entered and stained the muscle fibers. If you pressed the needle too far into the model, the solution may have instead stained the plate. If the needle was not deep enough, the solution would have stained the skin or possibly not been injected into the model.*

▶ ***Intramuscular injection on fruit*** – *If you placed the IM injection correctly, when you carefully peel back the skin you should be able to see the injection site*

and that the flesh of the fruit is deeply stained. If you pressed the needle too far into the model, the solution may have instead stained the plate. With the orange, it really isn't possible to press too far. If the needle was not deep enough, the solution would have stained the skin or possibly not been injected into the model.

▶ **Subcutaneous injection on fruit** – *If you placed the IM injection correctly, when you carefully peel back the skin you should be able to see the injection site and that the skin is deeply stained. The flesh of the fruit should be, at the most, only slightly stained. If the injection went too deep, the flesh will be soggy and deeply stained.*

18. After the participants have inspected their models, ask the following questions:

- ▶ Were you surprised by what you found when you inspected your models? Why?
- ▶ If your inspection showed that you placed an injection incorrectly on a model, how could you improve your technique for next time? (*Change the angle of the injection, insert the needle more or less deeply.*)
- ▶ What problems might be caused if you injected your project animal incorrectly? (*The medication wouldn't be delivered to the spot where it could work most effectively, the animal could have a bad reaction to the medication, the animal could experience muscle soreness or tissue damage.*)

19. When everyone has reported who wants to, read aloud or paraphrase the following:

Once you've reviewed your model, place all of your remaining supplies on your plate including your gloves. To keep from coming into contact with any contaminated material on your gloves, take them off by grasping the wrist end of one glove and pulling that glove down until it's wadded into a ball in the still-gloved hand. Then use your clean, ungloved hand to grasp the wrist end of the glove you're still wearing, and pull it down and inside out around the wadded up glove.

20. Have the volunteer helpers pick up all of the remaining Injection Kit items (the food products, towels and gloves). All of these can be disposed of in the trash bags. Have the volunteers or participants use disinfectant wipes to clean any spills from their work surfaces.

Continue here if your group will be doing the optional medication label investigation activity.

21. Read aloud or paraphrase the following:

Next we're going to work in pairs to inspect the label of a veterinary medication. You'll be looking for these six things about the medication.

[**Note:** You may want to write each item on flipchart paper as you read it and display the sheet where everyone can see it.]

- ▶ ***The name of the medication***
- ▶ ***Why you would use it***
- ▶ ***The proper dosage (how much to inject)***
- ▶ ***The injection method to use (such as IM or SC)***
- ▶ ***Whether the medication has a withdrawal time and what it is (how long you have to wait after injecting the medicine before you can harvest the animal or use or sell its milk)***
- ▶ ***The medication's expiration date***

Now I'm going to pass out [the sample medication label or an empty medication bottle] for you to inspect and a worksheet where you can write the six things you're looking for. When I give the signal, you'll have about 5 minutes to work together with a partner. When you've found all six things, raise your hand and someone will come around to check your answers.

22. Pass out the “Sample Veterinary Medication Label” handout and the “Reading a Veterinary Medication Label Worksheet.” Walk around and give a hint to any team that really seems stuck. You or a volunteer helper should check the worksheet answers of teams as they signal that they’re finished. If a team’s information is inaccurate or incomplete, help them make corrections.
23. After all of the teams have finished and had their worksheets checked, read aloud or paraphrase the following:

Reading medication labels is very important to do before administering any medication. It’s especially important to check the label before giving an injection so you can be sure you’re administering the correct medication in the correct amount, using the correct method. If you have trouble finding any of that information on a medication label, you should consult with your veterinarian before administering the medication.

Continue here if your group is not doing the medication label investigation activity.

24. Read aloud or paraphrase the following:

When administering medication, caretakers must always give the correct dosage in the proper location, using the proper injection method, and observing the withdrawal period (how long you have to wait after administering the medication until you can harvest the animal or use or sell its milk).

The only person who is authorized to change the dose, injection method and injection site is a licensed veterinarian, who takes responsibility for the changes based on his or her training and veterinary license.

It’s also important to note the medication’s expiration date. Just as foods spoil after a certain time, medications lose their effectiveness or may become toxic after they reach a certain age.

When you’re exhibiting animals at a competition, it’s essential that you review the rules for medicating animals at or before the event.

Proper disposal of needles and unused medications is also important. Place all sharps (including needles) in a puncture-proof container with a lid, such as a laundry detergent jug or a coffee can. (You can also buy sharps containers in many pharmacies or online.) Label the container “Danger – Medical Sharps Disposal Container” in permanent marker. Place the lid on the container and seal it with duct tape. Then put the sealed container in a trash receptacle for disposal in a commercial or municipal landfill.

We recommend – it’s not a requirement – that once all of the sharps have been placed in the sharps containers, you fill it with quick-dry cement. Then place the lid on the container and seal it with duct tape. Encasing the sharps in cement will help protect any landfill workers who may handle the container.

Dispose of unused or expired medications (human or veterinary) at an authorized drop-off site. Your local health department should be able to direct you to a disposal location.

[**Note:** You can find contact information for your local health department at <http://www.michigan.gov/mdch/0,1607,7-132--96747--00.html>.]

As the owner of an animal, you must keep records of any medications you give your animal for one year after your animal is sold. You can use the Michigan 4-H Animal Treatment Record Sheet that is available on the Michigan 4-H website to help you keep track of the medication you administer.

It is very important to be good stewards of animal agriculture. Today, you have learned how to properly give intramuscular and subcutaneous injections. This skill will help you prevent illness and treat your animals if they become ill. If you are ever in doubt about giving your animals any medication, whether prescription or over-the-counter, consult with your veterinarian.

ADAPTATIONS & EXTENSIONS:

- ▶ For a more affordable lesson with fewer supplies, replace the chicken breast with a banana or orange. Participants will need to carefully open the banana or orange to see the result of administering the intramuscular injection.
- ▶ To further reduce costs, more than one participant can practice both subcutaneous and intramuscular injections on the same banana or orange.
- ▶ Demonstrate IM and SC injections on a live animal to illustrate to participants the process and potential difficulties of giving injections to animals.
- ▶ If your group includes a mix of ages and experience levels, have the older or more experienced participants partner with younger or less experienced participants.
- ▶ If you don't have time to do the optional medication label activity in this lesson, you may want to add it to a later meeting.

For older or more experienced participants:

- ▶ Have participants bring in empty medicine bottles from their own farms. Use the information on the bottle label to create basic scenarios about the weight, age and condition of an animal, then have participants calculate how much of the medication to give the model animal and by what injection method.
- ▶ Discuss the less common methods of giving animals injections (listed in Table 3) with the group.

For younger or less experienced participants:

- ▶ Have participants perform each step of the injection procedure immediately after you demonstrate it. The lesson will take longer this way, but participants will be able to watch and then easily apply what they have seen for each step.
- ▶ Have participants practice the injection methods with one-on-one supervision from an adult or older teen volunteer helper who is experienced at giving injections to animals.
- ▶ Discuss only four common injection types (oral, subcutaneous, intravenous and intramuscular) with the group rather than the five described in Table 2.

TALKING IT OVER:

Ask the group the following questions.

- ▶ What was the hardest part of giving an intramuscular injection for you?
- ▶ What was the hardest part of giving a subcutaneous injection for you?
- ▶ Why is it important for animal caretakers to know how to give animals injections and vaccinations? *(So we can manage and prevent diseases in our animals.)*
- ▶ How can you use what you have learned to give or to help give injections to your own animals?
- ▶ What future role might technology play in injecting medications and vaccinations? *(New drugs come out on the market every year. Medications that only worked in the animal's system for 24 hours in years past are now effective for from 3 to 7 days. New vaccinations are licensed every year to prevent diseases such as Porcine Epidemic Disease Virus (PEDv). Some medications are now sold in syringes pre-loaded with the correct single dose.)*

ALIGNMENT TO SCIENCE & ENGINEERING PRACTICES:

How 4-H Increases Science Literacy

Nationally and in Michigan, 4-H has long enjoyed a reputation for engaging young people in positive, experiential (hands-on), and nonformal activities that are inquiry-based. The lessons in the *4-H Animal Science Anywhere* series can be used to enhance classroom science education in Michigan and elsewhere. Their activities are aligned with the eight Scientific and Engineering Practices (SEP) from *A Framework for K-12 Science Education* (National Research Council, 2012, p. 42).

The Michigan State Board of Education adopted a set of new state science standards in late 2015 that are based on the SEP. The activities in the *4-H Animal Science Anywhere: Building on Biosecurity* lesson were evaluated for their alignment with the SEP by MSU Extension Educator Tracy D'Augustino in 2015. The results appear in Table 4.

Table 4. How This Lesson Aligns With the Science and Engineering Practices (National Research Council, 2012, p. 42)

Science & Engineering Practices	Action	Activity Step
1. Asking questions (for science) and defining problems (for engineering)	▶ Participants explore why some medications are delivered by injection.	3
	▶ Participants explore why different injection methods and placements are needed when injecting livestock with medication.	3, 5, 7
2. Developing and using models	▶ Participants practice two injection methods on a model (chicken breast, orange or banana).	12-16
	▶ Participants explain how the model (chicken breast, orange or banana) connects to injection types and locations.	5-10, 17
	▶ Participants discuss the limits of their models, such as the thickness of the fruit skin compared to the thickness of an animal's skin.	17-18
3. Planning and carrying out investigations	Participants practice two injection methods.	14-16
4. Analyzing and interpreting data	Participants examine and discuss the results of the two injection methods.	17-18
5. Using mathematics and computational thinking	▶ Participants calculate the dosage of medication needed.	21-23
	▶ Participants accurately measure medication when preparing a syringe for an injection.	12, 14
6. Constructing explanations (for science) and designing solutions (for engineering)	Participants explain why and how different methods of injections are needed.	3, 5
7. Engaging in argument from evidence	Participants discuss the dangers of using the wrong injection method or site (or both) when administering medication to a project animal.	9
8. Obtaining, evaluating, and communicating information	▶ Participants gather evidence from their models and other resources to learn how to accurately administer medication to livestock.	5-8, 21-23
	▶ Participants share information about the types and locations of injections they can safely administer and know when to ask veterinarians for assistance.	24

REFERENCES & RESOURCES:

References

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Injection Methods & Procedures

Common abbreviations for the common injection methods discussed in this lesson are listed in this table. Fill in the full name of each injection method in the column next to its abbreviation, then in the final column describe where the injection is placed. Some information is provided to help you get started completing the chart.

Injection Method	Common Abbreviation for Injection Method	Injection Placement
<i>Oral</i>	PO, per-os	
	Not commonly abbreviated	<i>Through the nose into the nasal passage</i>
	IV	
	SC or SQ	
	IM	

Sample Veterinary Medication Label*

Read this sample medication label, then complete the “Reading a Veterinary Medication Label Worksheet.”

Omnibiotic
(Hydrocillin in Aqueous Suspension)

Directions for use: See Package Insert

For use in Beef Cattle, Lactating and Non-Lactating Dairy Cattle, Swine and Sheep.

Read entire brochure carefully before using this product.
For intramuscular use only.

Active Ingredients: Omnibiotic is an effective antimicrobial preparation containing hydrocillin hydrochloride. Each ml of this suspension contains 200,000 units of hydrocillin hydrochloride in an aqueous base.

Indications: **Cattle** - bronchitis, foot rot, leptospirosis, mastitis, metritis, pneumonia, wound infections. **Swine** - erysipelas, pneumonia. **Sheep** - foot rot, pneumonia, mastitis; and other infections in these species caused by or associated with hydrocillin-susceptible organisms.

Recommended daily dosage: The usual dose is 2 ml per 100 lb. of body weight given once daily.
Maximum dose is 15 ml/day.


Body Weight	Dosage
100 lb.	2 ml
300 lb.	6 ml
500 lb.	10 ml
750 lb. +	15 ml

Continue treatment for 1 or 2 days after symptoms disappear.

Caution: 1. Omnibiotic should be injected deep within the fleshy muscle of the neck. Do not inject this material in the hip or rump, subcutaneously, into a blood vessel, or near a major nerve because it may cause tissue damage. 2. If improvement does not occur within 48 hours, the diagnosis should be reconsidered and appropriate treatment initiated. 3. Treated animal should be closely observed for at least 30 minutes. Should a reaction occur, discontinue treatment and immediately administer epinephrine and antihistamines. 4. Omnibiotic must be stored between 2° and 8°C (36-46°F). Warm to room temperature and shake well before using. Keep refrigerated when not in use.

Warning: Milk that has been taken from animals during treatment and for 48 hours (4 milkings) after the last treatment must not be used for food. The use of this drug must be discontinued for 30 days before treated animals are slaughtered for food.

How supplied: Omnibiotic is available in vials of 100 ml.

TAKE TIME  OBSERVE LABEL DIRECTIONS

*Reprinted with permission from the National Pork Board.

Reading a Veterinary Medication Label

Worksheet

Use this worksheet to record the information about the six major indicators that you find on the sample veterinary medication label.

Information to Look for on the Label	Information Found on the Label
Medication name	
Indications (the condition or symptoms the medication is used to prevent or treat)	
Dosage (how much to administer)	
Proper injection method (such as intramuscular or subcutaneous)	
Withdrawal period (how long from the time the medication is administered until the animal can be harvested or milk from it can be used or sold)	
Expiration date (when the medication should no longer be used)	<i>The "Sample Veterinary Medication Label" included in this lesson does not list an expiration date.</i>

Michigan 4-H Animal Treatment Record Sheet

Use this record sheet, which is available online at http://msue.anr.msu.edu/uploads/236/71492/MI_Animal_Treatment_Record_Book_revised_2.pdf, to keep track of the medical treatment your 4-H project animal has received.

Name: _____ Veterinarian: _____



Michigan 4-H Animal Treatment Record Sheet

Detailed record keeping is important as it helps prevent mistakes, maintains continuity between treatments, and is useful to share with multiple caretakers or veterinarians. When treating an animal, record the following information in as much detail as possible. These records should be kept for one year after the sale of the animal.

Date	Animal ID	Product	Route	Amount Given	Given by	Reason for Treatment	Outcome
Example: 5-15-15	Spartan; Tag # 840003123456789	EXCEDE	Intramuscular (IM)	1.5 ml	KT	Thumping Couch; Consulted veterinarian	Waited 7 days 5-22: Recovered