

## **Workshop: Cows and chickens and beetles ... Oh my!**

Hi everyone, and welcome to EYH. Please use this worksheet as a guide through our virtual workshop. Links to videos are provided within. We hope you have a nice day full of learning about STEM, and we are sorry we couldn't meet you in person!

### **Breakdown of Events:**

#### **1. Introduction by team leaders (7 min)**

In the video below, our team leaders introduce themselves, and talk about career options in animal science.

Here is the link: [https://youtu.be/0C\\_Gmqg-M0M](https://youtu.be/0C_Gmqg-M0M)

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#### **2. Holy cow activity (18 mins)**

Learning objectives: Students will learn the differences and similarities between a human and a cow's digestive tracts and understand how a cow is better equipped to digest forages compared to humans. Students will learn how the microorganisms in a cow's rumen help them break down their feed, and then visualize this under a microscope.

Supplies needed at home: none

In the video below, one of our team leaders, Amanda Davis, does the following:

1. Shows a screen-recorded slide-show discussing the cow's digestive physiology (14 min)
2. Collects a rumen sample from our cannulated cow, Sunny (2 min)
3. Examines the rumen sample under the microscope in the lab to see the microorganisms that aid in digestion (2 min)

The link to the complete holy cow activity can be found here: [https://youtu.be/m2\\_DSfXtxQU](https://youtu.be/m2_DSfXtxQU)

#### **3. Egg candling activity**

Learning objective: Students will learn how to candle eggs and various applications of egg candling such as egg grading and observing embryonic development.

Learning objectives: Students will learn basic stages of chick embryology.

Today we will be learning how to candle eggs. For egg candling all you need is a bright light and some eggs! Egg candling allows you to look through the egg to see different parts of the egg. Two uses for egg candling that people use in the chicken industry is egg grading and embryology.

Egg grading is a way that we can measure the quality of an egg based on different traits. We can first look at traits on the outside of the egg with our naked eye. Using candling you can look at traits on the inside of the egg.

**Egg candling video:** <https://www.youtube.com/watch?v=Jz8w76s57Po>

In the video, they use a special light to look at the inside of the egg but I find that the flashlight on my phone works really well!

**Egg grading video:** The Difference Between Grade AA, A, And B Eggs

<https://www.youtube.com/watch?v=toMJU133kAo>

This video explains the difference between different grades of eggs. Egg grading is a way that we can measure the quality of an egg based on different traits. We can first look at traits on the outside like the shape of the egg and if there are any abnormalities in the shells. Sometimes you can see ridges or bumps on the eggs. *If you have eggs at home, try finding some that have any abnormalities on the shell.*

You can also look at interior qualities with egg candling. The most important thing that people look at with egg candling is the size of the air cell. An egg has a bunch of pores in its shells that allows carbon dioxide and moisture from the embryo to move out and air to move in and form the air cell. So as the egg gets older, the air cell gets bigger and we can use this to tell the quality of an egg. Grade AA is the highest grade meaning so these will have smaller air cells. Grade AA through B are healthy to eat but it becomes important in cooking. For example, if you are baking, you will probably want grade AA eggs, but if you are making scrambled eggs or hard-boiled eggs Grade B works fine.

## **Egg candling experiment**

### What you'll need

- Flashlight (the flashlight on your phone works great for this)
- 2 eggs
- Dark room
- Plate or tray

## Procedure

First take one egg and leave it out at room temperature overnight or for a few days. This will let your egg age faster and should decrease the egg grade.

Once you have your “old egg”, take the fresh egg and candle both your old and new eggs. You’ll want to do this in a dark room to see the air cell better. You want to find the air cell in both. (Hint: the air cell will be on the large part of the egg. It is sometimes hard to find but you should see a small circle at the end of your egg) *Do you see any differences in air cell size between the old and new egg?*

Next, crack open each of the eggs and look for any differences in the white of the egg. Make sure to crack open the eggs in a plate or a tray for easier clean up! *Can you see any differences in the thickness of the whites? Is one more runny than the other?*

## Questions

1. Did you see any differences in the size of the air cell between your old and new egg?
2. When you cracked open the egg, were you able to see any differences in the thickness of the whites?
3. Which egg has a more runny egg white and which has a thicker egg white?
4. Were you able to see any abnormalities on the outside of the egg?

## **Embryology**

A second application of egg candling is observing chick embryonic development. A lot of times, producers will want to check whether an egg has been fertilized and can be incubated to hatch a chick. Not every egg laid by breeder hens is going to be fertilized. When you incubate eggs, after a few days you can candle your eggs and look for blood vessels. Eggs that have blood vessels are fertilized and ones that do not, will not develop into a chick. From fertilization to hatch, it takes 21 days for a chick to develop.

Below are some cool videos that show chick development! There is also a link to a handout which writes out the different developmental events each day of development. You may want to look at the handout first and follow along with the video to observe the different stages.

### **Embryology cartoon**

<https://www.youtube.com/watch?v=PedajVADLGw>

### **Embryology time lapse of egg development**

<https://www.youtube.com/watch?v=5mDNWJRyg-l>

### **Embryology handout**

<http://extension.msstate.edu/content/stages-chick-embryo-development>

Questions:

1. How many days does it take for a chick to hatch after fertilization?
2. Which day do feathers start to develop?

3. What should you look at to see if an egg is fertilized?

#### 4. Dermestid Beetle EYH

Learning objective: Students will explore the ecological and practical application of scavenger feeding beetles to solve current environmental issues in waste accumulation.

Activity: Dermestid beetles can be used for a multitude of interesting purposes given their unique ability to consume keratin. One useful application for this is to help reduce keratin-rich waste that is generated as a by-product of the meat industries. Initially, the plan was to demonstrate the various ways that one could “reduce” feather waste, either by incineration (to be done by graduate student in a fume hood), chemical treatment (Draino), production of feather meal, or consumption by Dermestid beetles (examples available on lab bench). Students would then discuss the environmental implications for each of these methods and why the Dermestid beetles may be the most sustainable of these options. Since we are no longer able to do the full demonstration, learning objectives will be accomplished solely through a PowerPoint presentation followed by several discussion prompts at the end (**20 mins**).

Here is the link to the powerpoint presentation: <https://youtu.be/x9QFj0JtjC4>

Video of dermestid beetles and their use in museum curation \*\*Trigger warning: bird carcasses shown\*\*:

<https://www.youtube.com/watch?v=--AT2j3YCu8>