Cloverbud Investigators: Taking the Adventure Outside

February

Marvelous Mammals

Background: Mammals are marvelous creatures! Did you know that humans are mammals? We belong to the class "Mammalia". For this lesson we will become scientists studying the class Mammalia, but what does that mean? There are certain characteristics that ALL mammals have that make them a mammal. In this lesson, we will learn about those characteristics. We will also learn about some other characteristics that MOST mammals have and a few exceptions to the rules.

Month's Mystery: What makes a mammal a mammal?

Science Behind: Mammals are one of the most diverse classes of animals. Mammals live in nearly every available habitat on Earth, from the deepest seas to the highest mountains. In size they can be huge or quite small, extremely fast, or very slow, walk on two feet or four; eat only plants, eat only meat, or a bit of both. It can be very confusing to determine what animals should go into the mammal class. Scientists have established criteria for each animal class an animal must meet to be included in that class. In addition to these criteria, there are also lists of common features that MOST animals in the mammal class have but not all, there are a few rare exceptions. Let's start with the "must have" list to be a mammal.

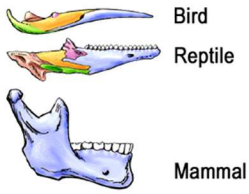
ALL mammals have the following eight things in common:

1. **Hair and/or Hair Follicles** - All mammals have hair growing on some part of their bodies, for at least part of their life spans. This hair can be thick and cover the whole body like fur, or it can be limited to a few hairs on their lip or chin. Sometimes the hair can even look like something else. For example, whiskers and quills are both illustrations of specialized hair.

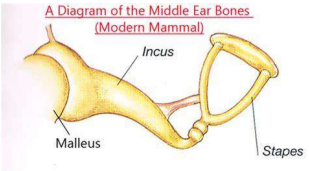
2. **Mammary Glands –** All mammals have specialized glands that produce milk for nursing their young. These special glands are called mammary glands which is how the mammal class got its name.

Last Updated by T. Winters 08/2020

3. **One-piece, lower jawbone attached directly to the skull** – All mammals have a one-piece lower jawbone that attaches directly to the skull and allows the mammal to bite and chew.

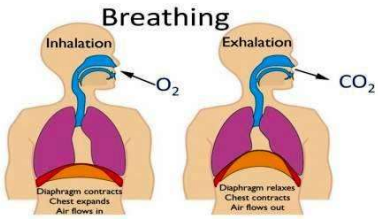


4. **A three-bone middle ear** - All mammals have three bones in their middle ear. These bones transmit sound from vibrations on the eardrum.



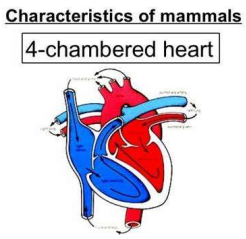
5. **Warm blooded** - All mammals are warm blooded which means they control their own body temperature. (Some other animals like birds are also warm blooded but are not in the mammal class.)

6. **Diaphragm -** All mammals have a diaphragm, muscles in the chest that expand and contract the lungs during breathing. (Some other animals, like birds, also have diaphragms but they are not as developed).



7. **Vertebrates -** All mammals are vertebrates which means they have a backbone. (There are other animals that also have backbones including birds and reptiles, but mammal backbones have developed differently to adapt to various means of travel: 2 legs vs. 4 legs.)

8. **Four-chambered heart** - All mammals have a four chambered heart which separates oxygen rich blood from deoxygenated blood. This system is more efficient in sending blood to the lungs and keeping oxygen flowing to the muscles, which allows for longer sustained physical activity. (Birds also have a four chambered heart.)

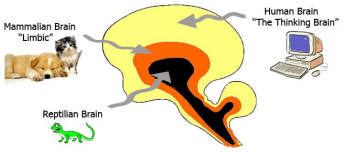


Last Updated by T. Winters 08/2020

The following list includes characteristics that <u>MOST</u> mammals have except for a few individual species.

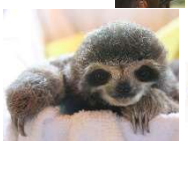
1. **Baby teeth** - Most mammals are born with a set of baby teeth, which fall out and are replaced with adult teeth. These are called deciduous teeth.


2. **Birth live young** - Most mammals give birth to live young. There are two exceptions, the platypus and the echidna, which are classified as mammals, but they lay eggs.



3. **Large brains** - Most mammals have uniquely large brains in relationship to their body size and are often very smart.

4. **Sweat Glands** - Most mammals have sweat glands, but whales, porpoises, dolphins, hippos, pigs, and rhinos' do not. Other animals like dogs and cats do not have very many sweat glands and rely on panting to cool their bodies. Primates and horses have the most sweat glands of all mammals.




5. **External Ears** - Most mammals have external ears that can be seen, but some like dolphins, whales and sloths do not.


6. **Good vision** - Most mammals have good vision, but a few animals like star nosed mole do not.

Activity one: What does it take to be a Mammal?
Explain that as scientists, we are going to be looking at all the different animals which are classified as mammals to figure out just what makes them a mammal.

Supplies and Do ahead
- Print mammal characteristics flash cards
- Print mammal, not a mammal cards

What to do: Ask the Investigators to think of an animal in their head. Then ask, what animal did you picture? (Most likely it will be a mammal.) As they name their animals have them guess if they think it is a mammal or not.

Next, introduce the characteristics of a mammal, using the Mammal Characteristics flash cards included in this lesson. Once the Investigators understand the eight characteristics that ALL mammals have, then go over the additional characteristics that MOST mammals display and talk

about some exceptions. Once everyone has a good idea of what makes a mammal a mammal then let them play the

Mammal – Not a Mammal card sort game.

- Working in groups or individually, have the investigators sort all the Animal cards stacking the mammals together. You can also challenge them to put the non-mammal picture cards into groups based on characteristics they share. Once everyone has had a chance to sort their cards, go over the answers. Talk about why each mammal fits into the mammal group, pointing out how they meet each of the eight characteristics. Then ask, "do they have any of the other common mammal characteristics?"

Activity two: Amazing Mammal Trivia

To understand just how different and amazing mammals can be play the Amazing Mammal Trivia game. *Divide into teams for a friendly trivia competition: The first team to get five answers right wins!*

1. **What is the largest mammal in the world?** *(Largest mammal is the Blue Whale at 98 ft and 397,000 lbs.)*
2. **What is the largest LAND mammal in the world?** *(The largest land mammal is the African bush Elephant at 22,930 lbs. and 10.5 ft tall)*
3. **What is Ohio's largest wild (nondomestic) mammal?** (*Black Bear – a large male black bear can weigh up to 600 pounds depending on availability of food.)*
4. **What is the smallest mammal in the world?** (By total mass, the Etruscan shrew is the smallest mammal weighing at most two grams, but the bumblebee bat is the smallest mammal by length and the size of the skull, measuring barely over an inch long.)
5. **What is Ohio's State Mammal?** (The White-Tailed Deer)
6. **What is the most intelligent mammal?** (The human)
7. **What are mammals called that eat only meat?** (Carnivores)
8. **What are mammals called that eat only plants?** (Herbivores)
9. **What are mammals called that eat both meat and plants?** (Omnivores)
10. **What animal can clean its own ears with their 20-inch tongue?** (A giraffe)
11. **What animal can dig a 300-foot tunnel in one night?** (A star nosed mole)
12. **What land animal can run up to 70 MPH?** (Cheetah)

Making Scientific Connections to nature:
Observing animal skins and skulls is a great way to introduce mammals to Investigators. The Gallia County Extension office has some replica animal skulls and some preserved skins available to 4-H advisors to use with their clubs. The Gallia County Soil and Water Conservation District also offers programming on local mammals. Additional resources may be available from the Ohio Division of Wildlife or local Conservation Clubs. In this activity, Investigators will observe sample mammal skulls and learn to identify if the animal is an **herbivore**, **carnivore,** or **omnivore** by looking at its teeth.

Supplies and Do ahead
- Sample mammal skulls of an herbivore, carnivore, and omnivore **or** pictures included with this lesson
- Pictures from Mammal Not a Mammal
- Mirror

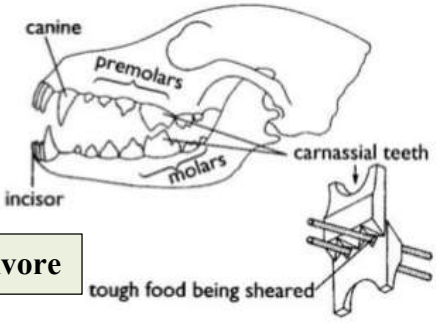
Optional Activity three: Mammal skulls: what can they tell us about the animal?

This activity works best with real or replica skulls that the Investigators can touch and observe closely, but can be done with skull pictures.

Background Information - Early spring is a great time to look for mammal skulls and deer antler sheds in Ohio. January and February tend to be months of high mortality for many mammals. Skulls can often be found along roadside ditches, in wooded areas and even in grassy fields. Identifying the skulls found, may be a little more difficult, but can be made easier if we can determine if the animal is a carnivore, herbivore, or omnivore. This is done by looking at the teeth. The teeth have evolved to perform different duties based on the feeding habits of the animal. Let's start with carnivores.

Carnivores are animals that feed mainly on the flesh of other animals through predation or scavenging. They need meat protein in their diet to survive. An example of an Ohio carnivore is the bobcat. While all cat species are considered true carnivores, other animals like dogs and wolves are also carnivores, but they tend to eat small amounts of plant-based foods as well. When looking at teeth, you can determine if an animal is a carnivore by looking for the carnassial teeth. Only carnivores have them. The diagram below shows the teeth of a carnivore.

The **carnassial teeth** are found in the back of the jaw and are what is called pass over teeth.



Carnivore

Carnassial teeth

They pass over or slide past each other kind of like scissors shearing off flesh. A carnivore will also have large **canine** teeth. These are the sharp, spiked teeth found near the front sides of the mouth. The **canines** are used to kill, grip, and hold the flesh of another animal. Carnivores will also have small sharp **incisors** which are in the front

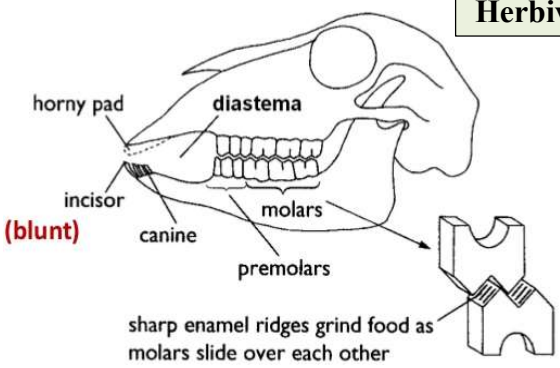
https://www.slideshare.net/SECBIO/teeth-28068645?next_slideshow=1

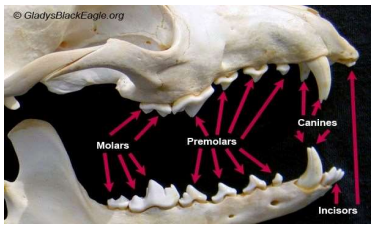
Last Updated by T. Winters 08/2020

of the mouth that are used to cut flesh and grip the prey. Finally, the carnivore has sharp **premolars** and **molars** that can have some small cusps on them. The molars are wider and flatter than the canines and found between the carnassial teeth and the canines. They come together to grind and crush bones.

Next, we will look at herbivores. Herbivores are plant eaters; they do not eat meat or flesh of other animals. An example of an Ohio herbivore would be the white-tailed deer. When looking at an herbivore skull, the distinction that sets them apart is the **diastema**. In the diagram below you can clearly see a hollow space or gap between the **incisors** and the **premolars**. This space is called the **diastema,** and it allows vegetation to accumulate and slowly work its way back to the **molars**. The diagram also shows that the herbivore has **incisors** in the front of the skull. Normally these are large, and they use them to slice the vegetation. Some herbivores like goats and deer do not have top **incisors**; instead they have what is called a **horny pad**. This pad is a very hard bone that allows the bottom teeth to slice the vegetation from a plant or the ground. Other herbivores like horses and rabbits have top incisors that allow them to bite off vegetation. Some have **canine** teeth, but these are normally small and blend in with the **incisors**. Behind the diastema is the premolars and molars. These are similar in size and shape and provide a large surface area as they slide over each other crushing and grinding the fibrous vegetation.

Herbivor





Finally, we will look at omnivores. Omnivores are the most diverse eaters; they eat both plants and meat depending on what is available. We can think of them as opportunistic feeders and as such, omnivores need teeth that will help with their varied diets. The raccoon is an Ohio omnivore, but the best example of an omnivore is a human. Like carnivores, they have larger **canines** to grab and tear meat, although most omnivores **canines** are not quite as large as true carnivores. They also have **incisors** in the front of their mouth, which are smaller than the **canines** and somewhat flatter, but they still help to bite or hold food. They also have flat, wide molars and premolars that are used to crush and grind food. The big difference between carnivore and omnivores is the absence of the **carnassial teeth.**

Last Updated by T. Winters 08/2020

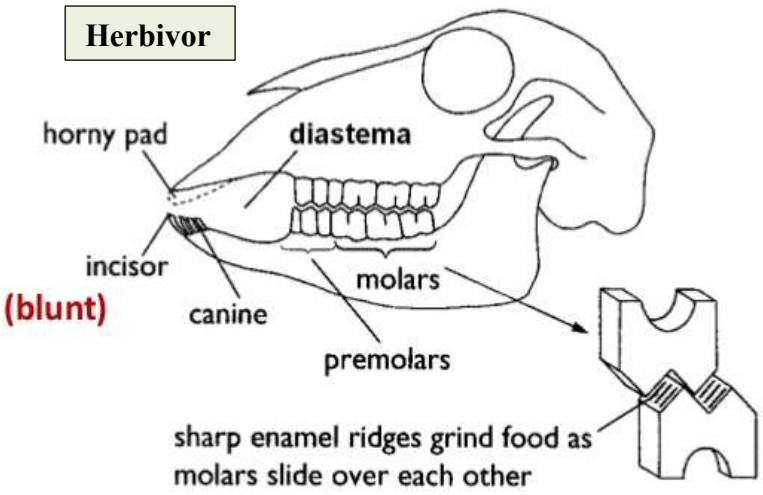
(Activity 3)

What to do:

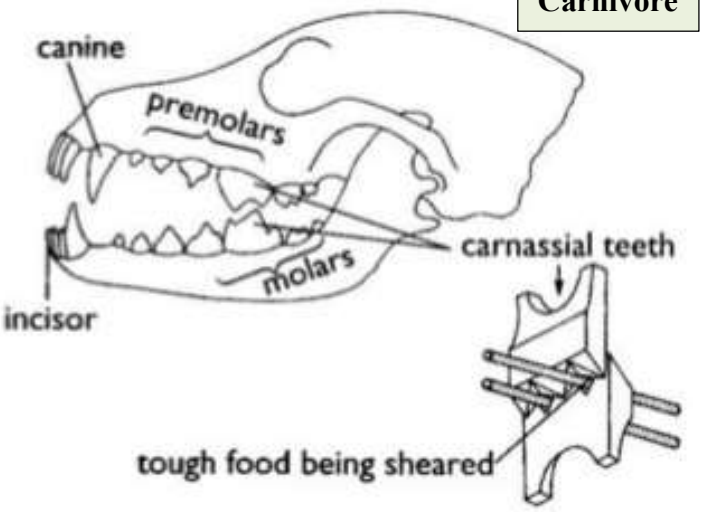
1. Using real or replica skulls, allow Investigators to examine a carnivore, omnivore, and herbivore skull. (Pictures can be used if skulls cannot be found.)
2. Discuss differences between these three skulls
3. Using the mammal cards from the *Mammal Not a Mammal* game in lesson one, define and discuss the differences between carnivores, herbivores and omnivores. Discuss what each eats and if they might be predator or prey. During your discussion have the Investigators sort the mammals into carnivores, herbivores and omnivores.
4. *Set the omnivore skull aside and look at only the carnivore and herbivore skulls.*
5. Ask, "Do you see a skull that has teeth that could be used for catching and killing prey, as well as tearing meat from a bone?" Using the diagrams included in this lesson, point out the different carnivore teeth and what their purpose is to the animal.
6. Ask, "Do you see a skull that has teeth that could be used for grinding up plants?" Again, use the diagrams included in this lesson to point out the different herbivore teeth and their purpose to the animal.
7. Once the Investigators clearly understand the difference between a carnivore and an herbivore, go back to the omnivore skull. Discuss how the omnivore eats both so it needs teeth like both. Point out the lack of carnassial teeth on the omnivore skull.
8. Using a mirror allow the investigators to examine their own teeth, with the understanding that they are omnivores. Discuss how their teeth help them eat their favorite foods.
9. Give the Investigators a skull, or skull replica to identify as a carnivore, herbivore, or omnivore based on their new knowledge.

Last Updated by T. Winters 08/2020

Herbivor

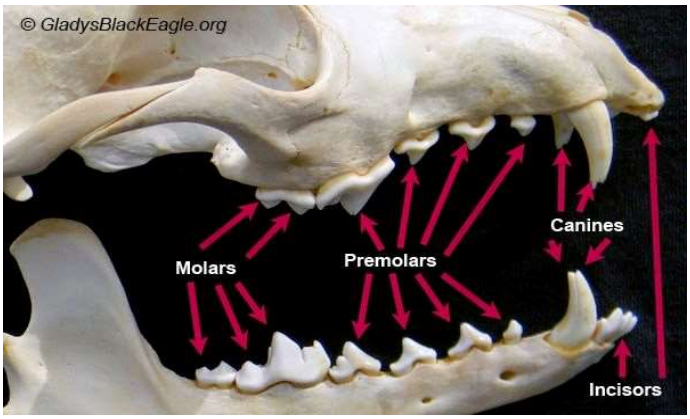


Carnivore



Diastema

Carnassial teeth



Omnivore

Last Updated by T. Winters 08/2020

Taking the Adventure Outside: Take a field trip to look for mammal bones or signs of mammals. Mammal bones can often be found along roadside ditches, or in forested areas. A state park or state forest is another great place to observe signs of wildlife. Often seeing a mammal in the wild takes some patience and skill. Sometimes we will see signs of the mammals but not the mammals themselves. (A great extension to this lesson is the Wildlife Tracks lesson offered in Cloverbud Investigators Career Detectives.) Additionally, Investigators my choose to visit a zoo to see exotic mammals or take a field trip to a farm to observe livestock.

Career Connections*: Wildlife Biologist, Ecologist, Biologist, Veterinary Medicine*

Go Over Findings:

Name two characteristics that make a mammal a mammal. *(Mammary gland, 4-chamber heart, three ear bones, warm blooded, have hair, one jawbone, have a diaphragm, have a backbone.)*
What is a carnivore? *(an animal eats and needs meat in its diet)*
What does an herbivore eat? *(plants)*
Name an omnivore? *(human)*
Name a type of tooth that mammal have in their mouth? *(Canines, molars, pre-molars, incisors,* carnassial*)*
What is the space called in a herbivores mouth that allows the vegetation to collect before sending it to the molars to be ground up? *(diastema)*

Investigate, Create, & Take: Investigators can take with them:

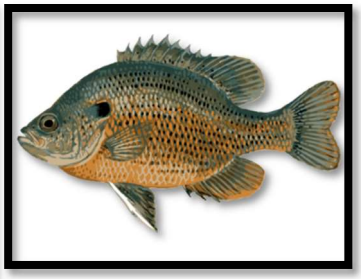
Make it take it Mammal Masks

Animal masks are fun and easy to make. All you need is some cardstock or paper plates, a large craft stick for a handle and some craft supplies to decorate them. You can download a wide range of patterns for print and let the Investigators color and decorate them as they wish.

Last Updated by T. Winters 08/2020

Mammal Not a Mammal Animal Cards (Activity 1)














Pictures from Shutterstock.com and www.activewild.com

THE OHIO STATE UNIVERSITY
COLLEGE OF FOOD, AGRICULTURAL, AND ENVIRONMENTAL SCIENCES

Last Updated by T. Winters 08/2020

Mammal Not a Mammal Animal Cards (Activity 1)

















Pictures from Shutterstock.com, and www.ActiveWild.com

Last Updated by T. Winters 08/2020

All Mammals Have Hair

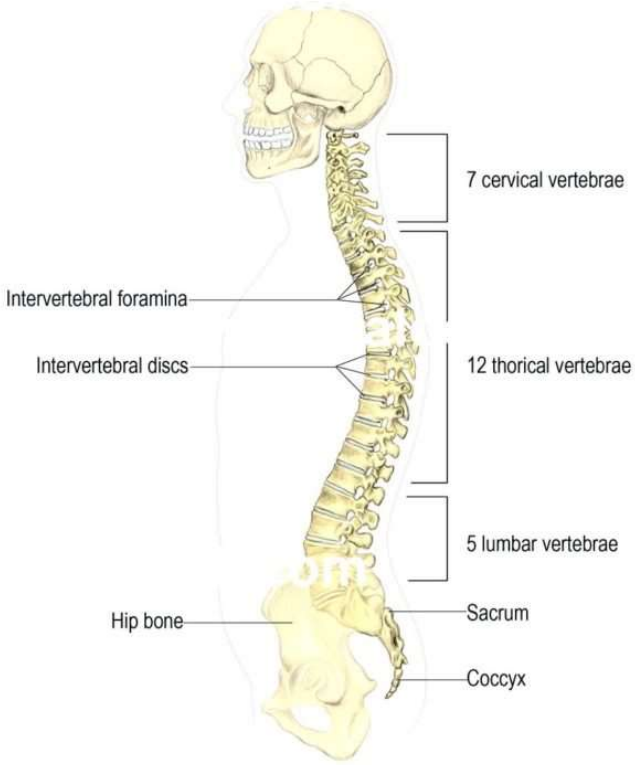
Hair and/or Hair Follicles *- All mammals have hair growing on some part of their body for at least part of their life span. This hair can be thick and cover the whole body like fur, or it can be limited to a few hairs on their lip or chin. Sometimes the hair can even look like something else. For example, whiskers and quills are both illustrations of specialized hair.*

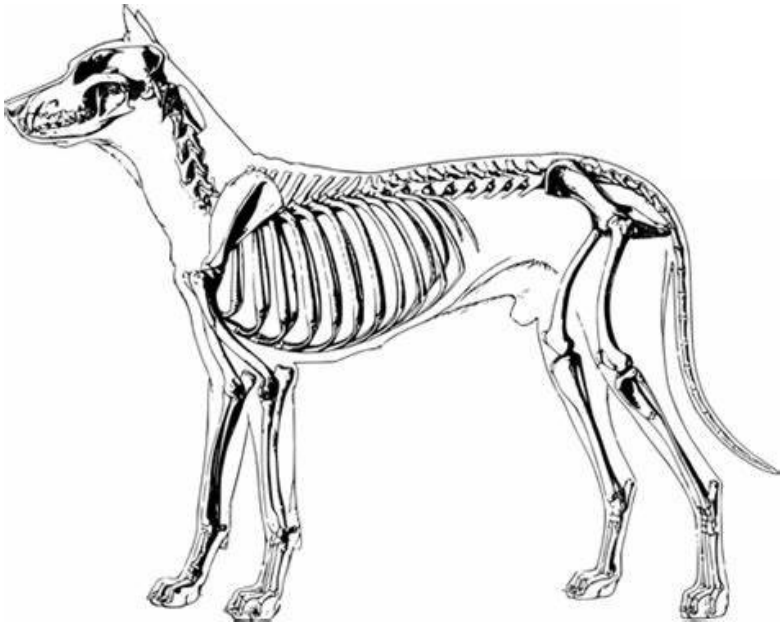
Pictures from Shutterstock.com, and www.ActiveWild.com

Last Updated by T. Winters 08/2020

All Mammals Have a Backbone

Vertebrates - *All mammals are vertebrates, which means they have a backbone. (There are other animals that also have backbones, including birds, and reptiles, but mammal backbones have developed differently to adapt to various means of travel: 2 legs vs. 4 legs.)*





Pictures from Shutterstock.com, and www.ActiveWild.com

Last Updated by T. Winters 08/2020

All Mammals are warm blooded

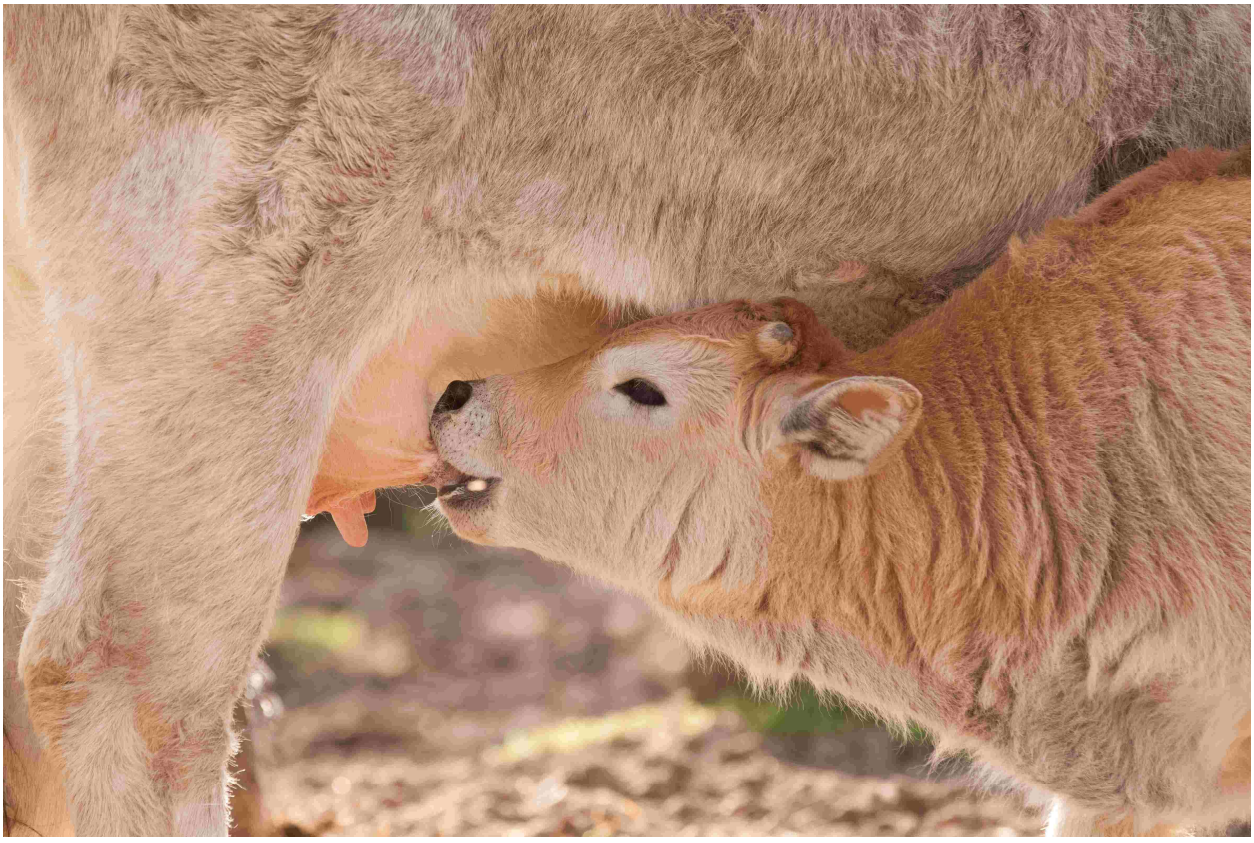
Warm blooded *- All mammals are warm blooded, which means they control their own body temperature. (Some other animals like birds are also warm blooded but are not in the mammal class.)*

Pictures from Shutterstock.com, and www.ActiveWild.com

Last Updated by T. Winters 08/2020

All Mammals have mammary glands that make milk for their babies

Mammary Glands – *All mammals have specialized glands that make milk for nursing their young. These special glands are called mammary glands, which is how the mammal class got its name*

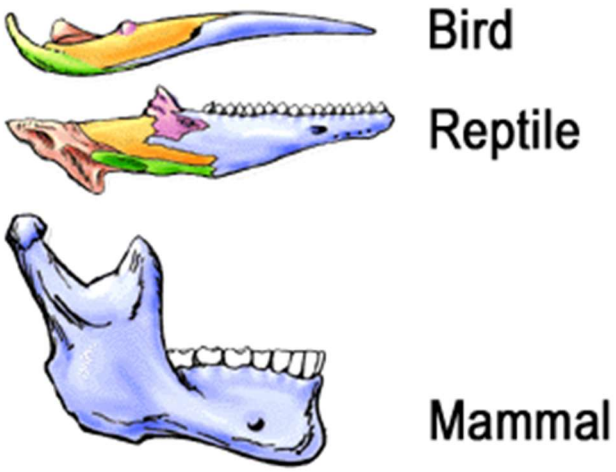


Pictures from Shutterstock.com, and www.ActiveWild.com

Last Updated by T. Winters 08/2020

All Mammals have a one-piece jawbone

One-piece, lower jawbone attached directly to the skull – All mammals have a one-piece lower jawbone that attaches directly to the skull and allows the mammal to bite and chew.

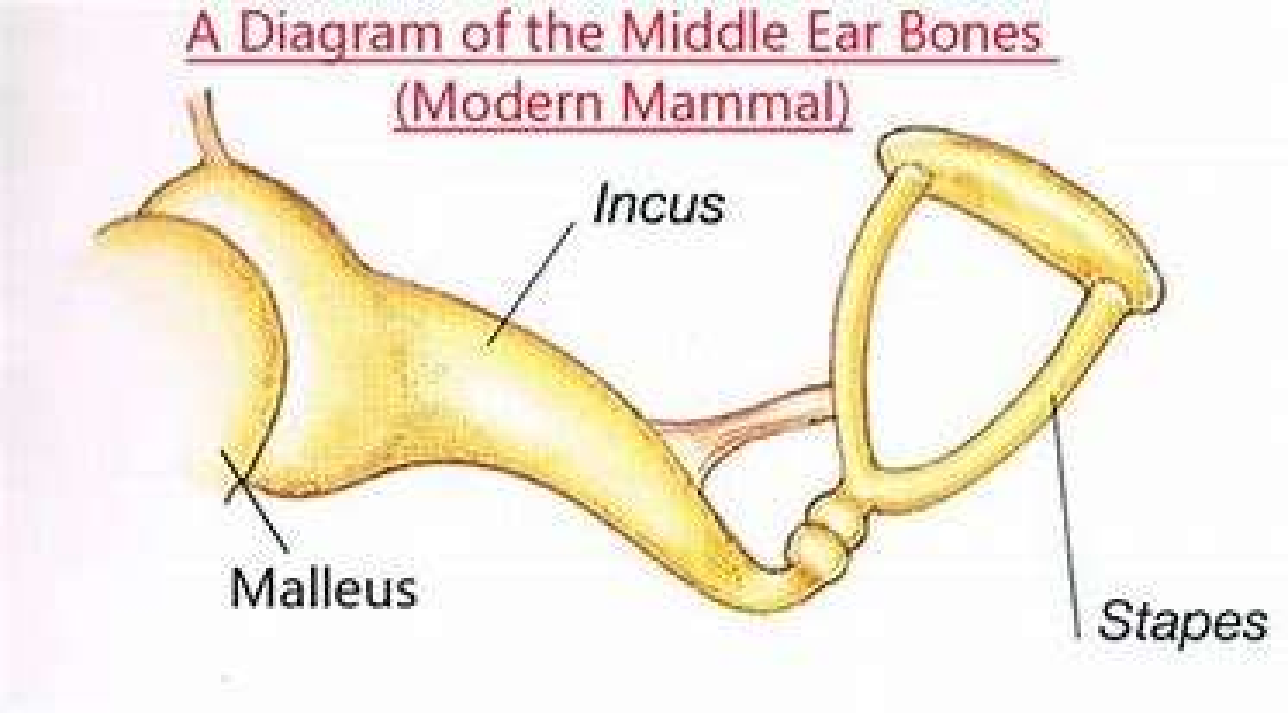


Pictures from Shutterstock.com, and www.ActiveWild.com

Last Updated by T. Winters 08/2020

All Mammals have three bones in their inner ear

A three-bone middle ear *- All mammals have three bones in their middle ear. These bones transmit sound from vibrations on the eardrum.*

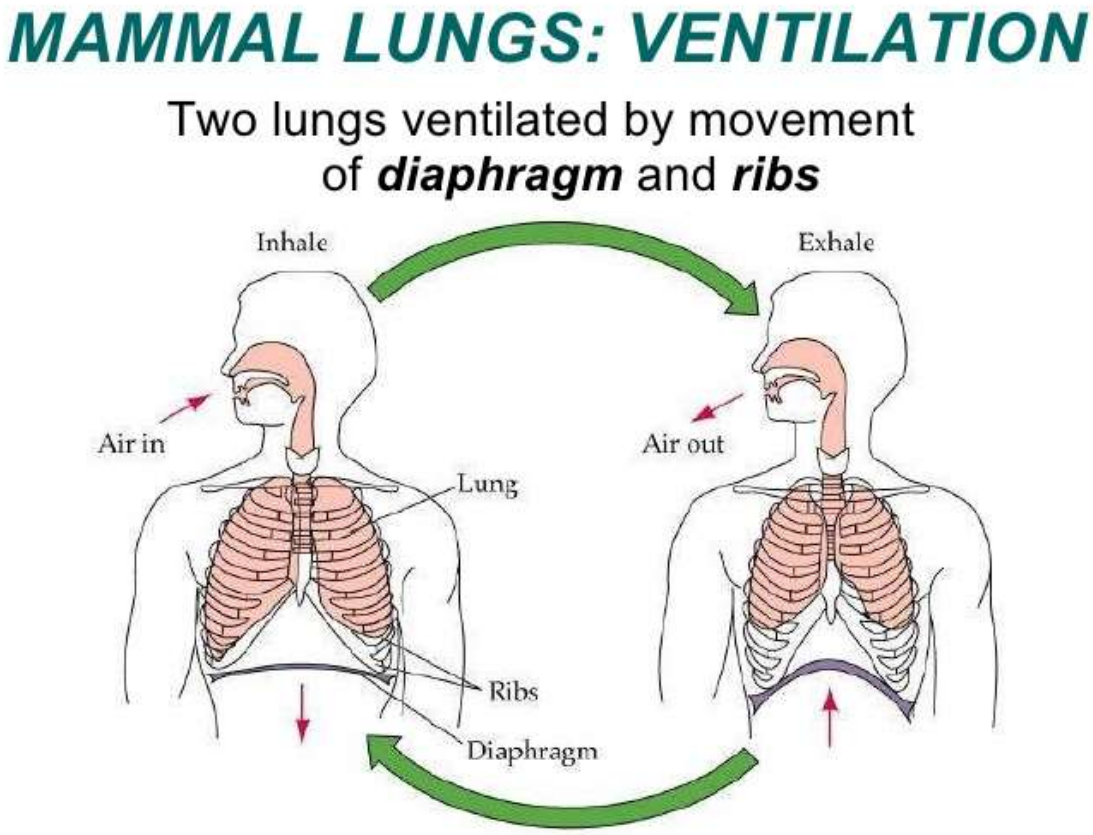


Pictures from Shutterstock.com, and www.ActiveWild.com

Last Updated by T. Winters 08/2020

All Mammals have a diaphragm

Diaphragm - *All mammals have a diaphragm, muscles in the chest that expand and contract the lungs during breathing. (Some other animals, like birds, also have diaphragms but they are not as developed)*

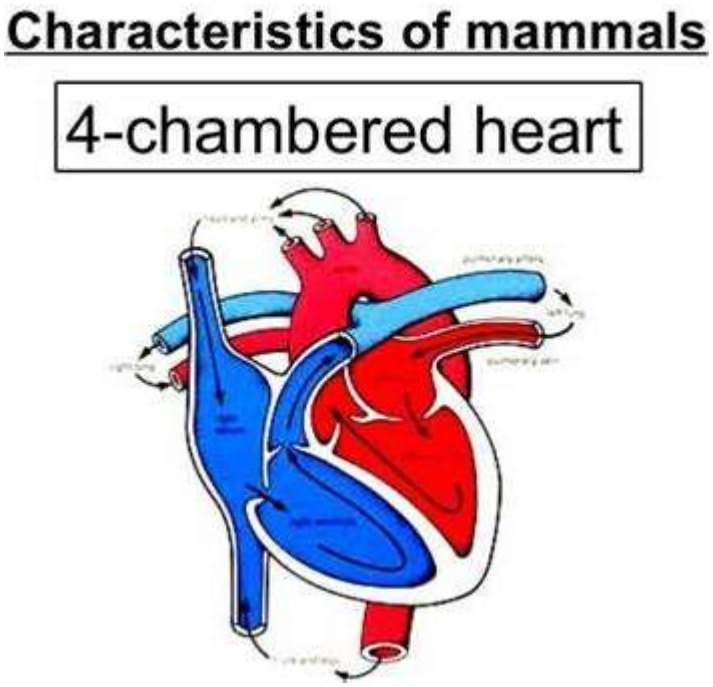


Pictures from Shutterstock.com, and www.ActiveWild.com

Last Updated by T. Winters 08/2020

All Mammals have a 4-Chambered Heart

Four chambered heart *- All mammals have a four-chambered heart, which separates oxygen rich blood from deoxygenated blood. This system is more efficient in sending blood to the lungs and keeping oxygen flowing to the muscles which allows for longer sustained physical activity. (Birds also have a four-chambered heart.)*



Pictures from Shutterstock.com, and www.ActiveWild.com

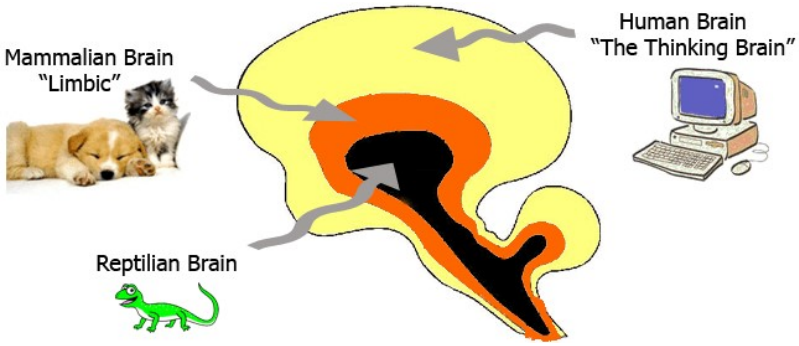
Last Updated by T. Winters 08/2020

Characteristics of most mammals

Baby teeth *- Most mammals are born with a set of baby teeth, which fall out and are replaced with adult teeth*

Birth live young *- Most mammals give birth to live young. There are two exceptions, which are classified as mammals but lay eggs, the platypus, and the echidna.*

Large brains *- Most mammals have uniquely large brains in relationship to their body size and are often very smart*



Pictures from Shutterstock.com, and www.ActiveWild.com

Last Updated by T. Winters 08/2020

Sweat Glands *- Most mammals have sweat glands, but whales, porpoises, dolphins, hippos, pigs and rhinos' do not. Other animals like dogs and cats, do not have very many sweat glands and rely on panting to cool their bodies. Primates and horses have the most sweat glands of all mammals*

External Ears - Most mammals have external ears, that can be seen, some like dolphins, whales and sloths do not.

Good vision - Most mammals have good vision, but a few animals like star nosed mole do not.

Pictures from Shutterstock.com, and www.ActiveWild.com

Last Updated by T. Winters 08/2020

Sources:

https://www.ducksters.com/animals/mammals.php

https://www.bing.com/images/search?q=clip+art&qpvt=clip+art&FORM=IGRE

https://dnr.maryland.gov/wildlife/Documents/Key-Common-Mammal-Skull.pdf

http://bookbuilder.cast.org/view_print.php?book=32842

https://wildlife.ohiodnr.gov/portals/wildlife/pdfs/publications/id%20guides/pub344.pdf

http://www.lakesidenaturecenter.org/AOM%20-%20General%20%20Mammal%20Skulls%20and%20Teeth.pdf

https://www.livescience.com/53483-omnivores.html

https://www.slideshare.net/SECBIO/teeth-28068645?next_slideshow=1

https://www.discoverwildlife.com/how-to/identify-wildlife/how-to-identify-mammal-skulls/

http://wildlife.ohiodnr.gov/species-and-habitats/species-guide-index/mammals

Developed by Tracy Winters, OSU Extension, Gallia County Extension Educator, 4-H Youth Development, winters.5@osu.edu. Tiffany Sanders Riehm, Gallia County 4-H Program Assistant, 4-H Youth Development, riehm.11@osu.edu. Edited by: