

From: <http://americanblackbearresource.weebly.com/digestive-system.html>

The American Black Bear's Digestive System

The American black bear digestive system is very similar to that of a human because they are both mammals. The first step is that the black bear mechanical (chewing) and chemical (enzymes) digests the food in it's mouth by using the salivary glands which are triggered by food coming into contact with the bears oral cavities (mouth). The food then goes down the pharynx to esophagus where peristalsis push the food into the stomach. The stomach produces a gastric juice which kills all the bacteria. The gastric juice also contains pepsin in it. Pepsin is an enzyme chemically breaks down proteins. Then the liver makes bile and sends it to the gallbladder and the gallbladder sends it to the small intestine. In the small intestine the bile salts absorbs and digests fats and holds onto wastes from the liver. This takes place in the duodenum the first part of the small intestine. The duodenum is where the stomach juice comes next after being in stomach and is churned with juices from the liver, pancreas and gallbladder. The pancreas then sends enzymes to the small intestine such as amylases or maltase. Amylases are proteins that turn starch into sugar. Maltase finishes digestion by splitting the two molecules in glucose apart. Then the small intestine absorbs the nutrients from the food through small finger like projections called the villi that are on the lining of the small intestine. Other enzymes that occur in the small intestine are nucleases. Nucleases chemically break down the DNA and RNA in our food and put it the correct nucleic acids. After that the large intestine absorbs the excess water. Then the rectum pushes the feces (poop) out. In the winter bears hibernate and don't eat for 5-6 months. This means that they slow down there metabolism which means that they do not need food throughout their hibernation. When they do wake up they eat berries, fish, rabbits, plants, deer and other organisms.

Diffusion in the Digestive System

Diffusion occurs in the villi which as we know are on the walls of the small intestine. To be more specific on how these tiny projections absorbed nutrients we must understand what they are made of and how exactly they work. Millions of villi cover the small intestine. The center of a villi has one artery, a small piece of muscle and a capillary. The layer on the outside of the central area is a mucous membrane. This membrane is made up of two cells. 1. Long and thin cells. 2. Bottle looking cells. There are about 600 microvilli on the thin cells that help in absorption. Villi in the small intestine move back and forth and this is to raise blood flow and increase diffusion of nutrients.

Source:

<http://www.britannica.com/EBchecked/topic/629261/villus>

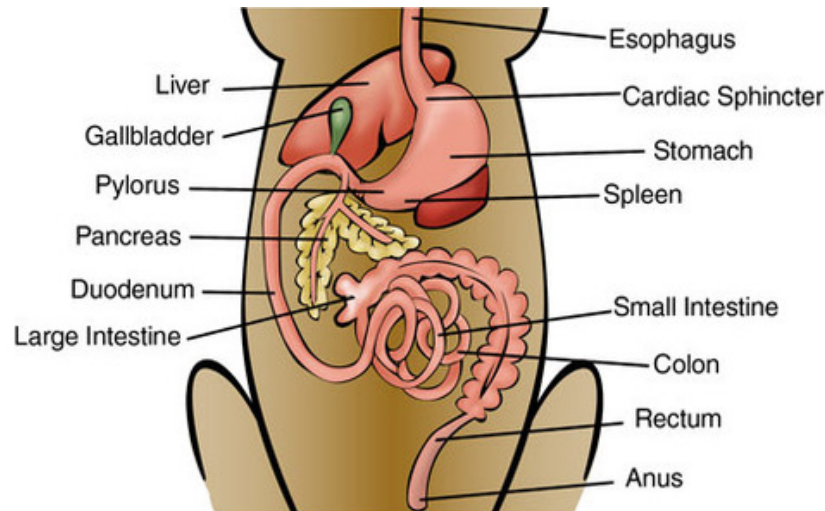
The American Black Bear Digestive System

(source: <http://blackbearresource.weebly.com/digestive-system.html>)

A black bear cannot digest mature plants. The digestive tract is short, only 40% of a typical herbivore. (1) This means the bear can't digest tougher cellulose. They depend on stomach muscles to break down food. (2) Black bears need to consume and will do whatever it takes.

(1) http://www.bearnovascotia.ca/bear_biology.htm

(2) http://www.bearnovascotia.ca/bear_biology.htm



Pathway of Food!

- 1) They eat whole pieces of prey with their Canine teeth.
- 2) Then they take small pieces with their bicuspid and carnassial teeth and swallow the smaller pieces whole. (3)
- 3) It travels down the esophagus and into the stomach.
- 4) In the stomach, acid breaks down food into a liquidy mixture. (4)
- 5) This liquidy mixture enters the small intestines, where it is broken down even more.
- 6) These basic components are absorbed into the bloodstream. (5)
- 7) The leftovers go to the large intestines.
- 8) In the large intestines water is drawn out.
- 9) This water leaves the body by the anus as excrement. (6)

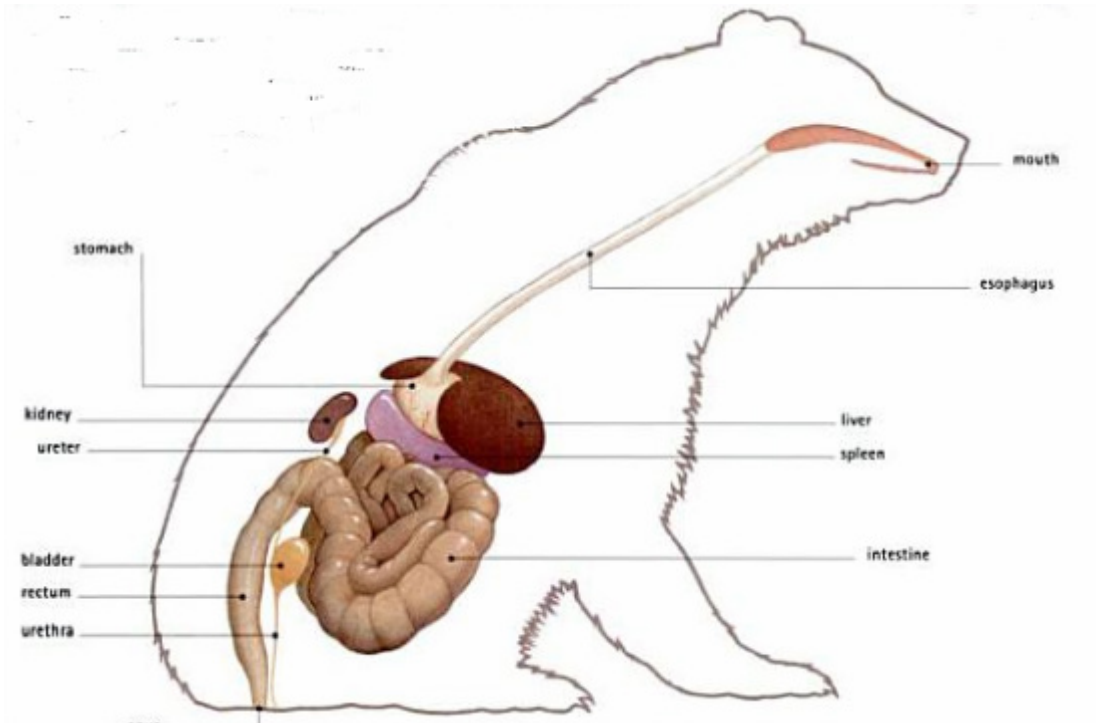
(3) <http://www.essortment.com/mammals-digestive-system-26910.html>

(4) http://kidshealth.org/kid/htbw/digestive_system.html

(5) <http://www.earthlife.net/mammals/diet.html>

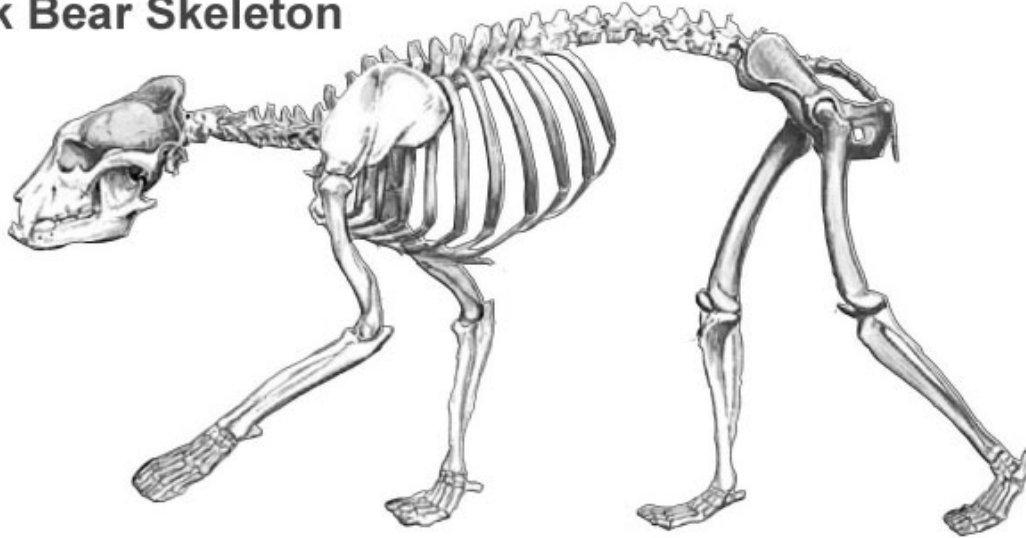
(6) <http://library.thinkquest.org/15873/zoo/digestive/animals.shtml>

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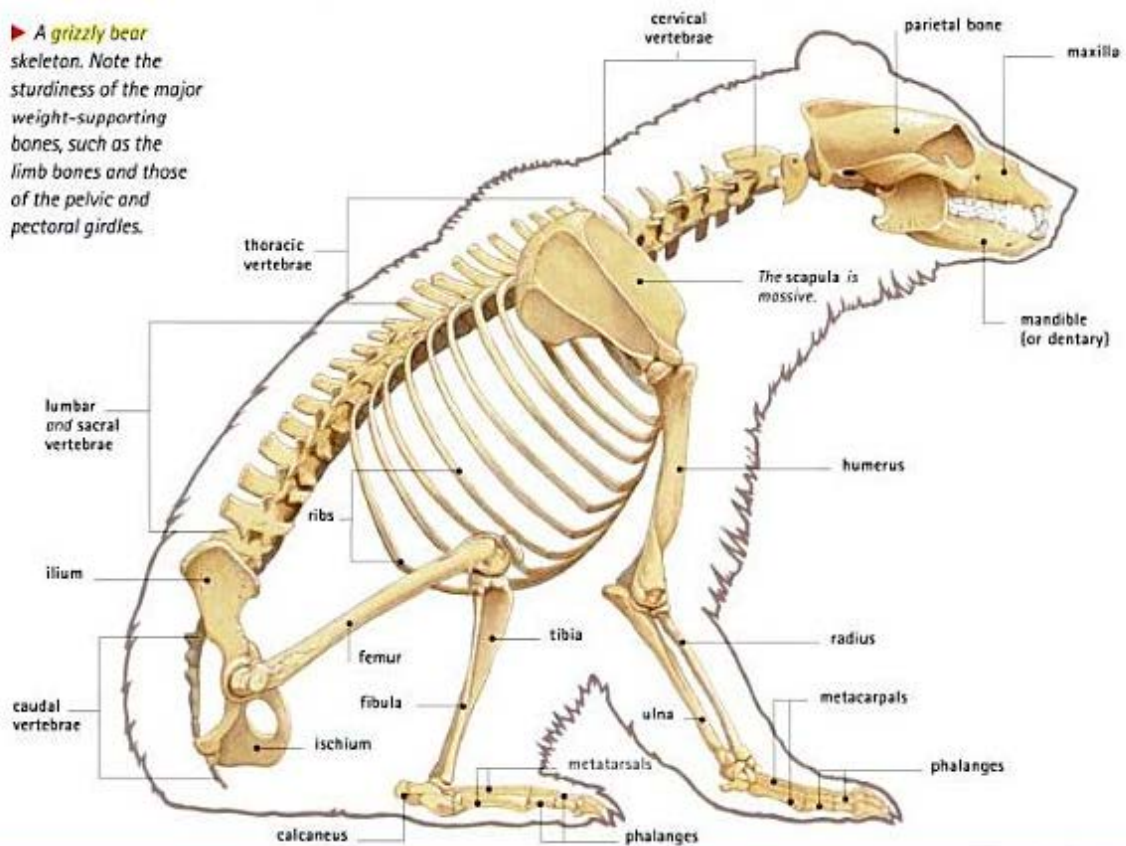
Source: <http://nrmrsgren.weebly.com/m---movement.html>

Black Bear Skeleton



Source: <http://nrmrsgren.weebly.com/m---movement.html>

► A **grizzly bear** skeleton. Note the sturdiness of the major weight-supporting bones, such as the limb bones and those of the pelvic and pectoral girdles.



Source: <http://nrmrsgren.weebly.com/m---movement.html>

From: <http://blackbearresource.weebly.com/reproductive-system.html>

Reproduction

The American Black Bear needs to reproduce in order for the species to exponentially grow. Exponential growth is where each generation doubles. They perform sexual reproduction with one male and one female. Both female and male bears have different organs to reproduce. The female reproductive system of The American Black Bear is similar to many other animals. (shown above). Sexual reproduction happens when the gametes conjoin in a process of internal fertilization. The female gametes (sex cells) are eggs, while the male gametes (sex cells) are sperm. Female sex cells are made by oogenesis. Male sex cells are made by spermatogenesis. The egg is in the ovary. When mature the egg goes to the oviduct where fertilization takes place. The egg will develop and grow in the uterus. When sexual reproduction is happening the cervix is where the sperm will enter. While the vagina is very important for sexual reproduction it also keeps bacteria out of the body. The male sperm is made by the testicles. American Black Bears epididymis stores sperm. For sexual reproduction sperm travels from the epididymis through the vas deferens to the prostate to add other liquids. From this semen is made. (1) The scrotal sac (shown below) helps regulate temperature so sperm can exist for sexual reproduction. Black bears mate in May and late June. An interesting fact about Black Bear courtship is the males follow females and they often rest together. (2) Black bears have 74 chromosomes and 37 haploid chromosomes. (3) The bears become sexually mature anywhere from 3-7 years. (4)

(1) http://www.esf.edu/aec/adks/mammals/black_bear.htm

(2) <http://www.bear.org/website/bear-pages/black-bear/reproduction/15-courtship-and-mating.html>

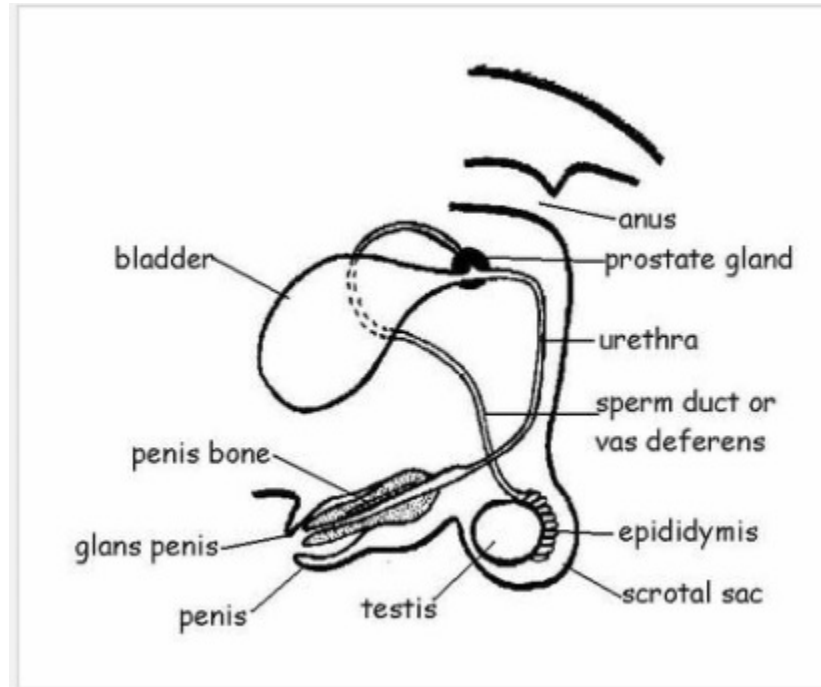
(3) http://en.wikipedia.org/wiki/List_of_organisms_by_chromosome_count

(4) http://www.michigan.gov/dnr/0,1607,7-153-10363_10856_57530_57536---,00.html

Reproductive Barriers

There are two types of reproductive barriers: Prezygotic and Postzygotic. Prezygotic is when individuals are physically unable to mate. This might be because of a different number of chromosomes, social pheromones, and reproductive structures such as the female reproductive tract. Postzygotic is when the mating creates a hybrid that don't survive; sterile.

Reproductive System of The American Black Bear (male):



The gestation period for The American Black Bear is 180 days. Most embryo development takes place during the last 6-8 weeks the bear is pregnant. (1) Life expectancy is anywhere from 10-15 years. Females give birth in around December. Cubs are covered in short grey fur when they are born. The cubs eyes are closed for 30-40 days. They start to walk in 40-45 days. (2) In the womb the black bear is a first a zygote (fertilized egg), then a blastocyst, then an embryo, and then a fetus. (3) Females give birth to 1-6 cubs, and there is parental care. (4)

(1) http://www.esf.edu/aec/adks/mammals/black_bear.htm

(2) http://wildpro.twycrosszoo.org/S/0MCarnivor/ursidae/ursus/Ursus_americanus/07Ursus_americanusLifePhys.htm

(3) http://www.michigan.gov/dnr/0,1607,7-153-10363_10856_57530_57536---,00.html

(4) <http://www.caveslime.org/kids/cavejourney/SpeciesAccounts/BlackBears.html>

Source: <http://nrmrsgren.weebly.com/r---respiration.html>

The Respiratory System

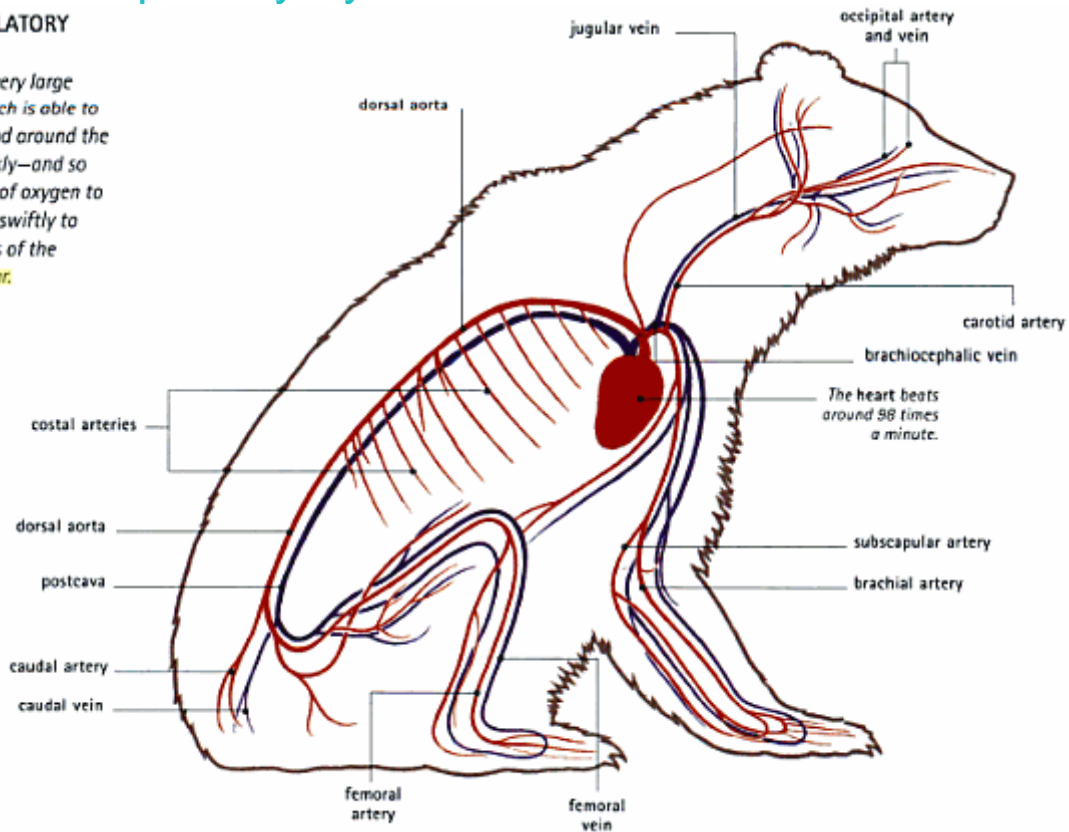
The Respiratory System is a very important part of an organisms lifestyle. The system supplies oxygen to muscles, enabling them to work and move. To explain in brief, the role of the respiratory system is to exchange gases which the body needs and has already exhausted.

The respiratory system is reliant on another system called the circulatory system. Without the circulatory system, all the work that the respiratory system does is put to waste.

How the Respiratory System Works

► CIRCULATORY SYSTEM

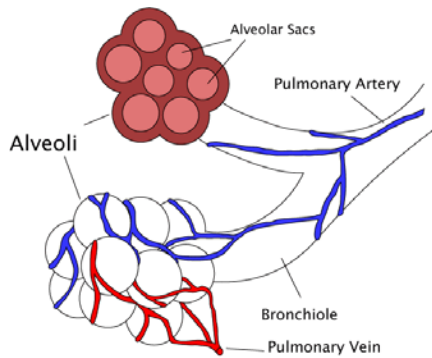
Note the very large heart, which is able to pump blood around the body quickly—and so allow lots of oxygen to be passed swiftly to the tissues of the grizzly bear.



Breathing/Inhalation

To exchange gases, there must be a source to collect from first. Inhaling is the process of getting an intake of air. There are two possible pathways to get this air from the outside. The **mouth** is one way of breathing in air and the **nose** is another way. Because the mouth and the nose is completely connected, it doesn't matter which way the air goes through.

After the air enters into the organisms, the air will travel down the **trachea**- a long tunnel which goes down the throat. After passing further down the trachea, it reaches the **larynx** (the voice box) which is also connector to the **bronchi**. The bronchi is a tree branch shaped part of the body which has two tunnels which break off (called the **bronchus**). Each of these tunnels lead to one lung.



The air will travel down one of the bronchus' and eventually through the path, they sub divide into bronchial tubes and once again sub divide into small grape look alike things called alveoli.

These alveoli are grape shaped and are were gas exchanges happen.

As the body inhales, intercostal muscles - muscle located in between the ribs- come up and outwards and the diaphragm relaxes creating large volume in the chest.

Exhalation

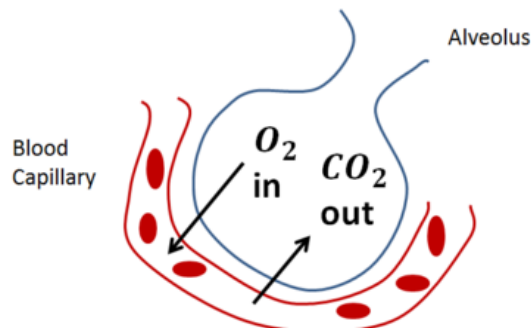
To exhale the air, the process is just reversing. Th air will come back up through the bronchial tubes, up through the bronchus and back through the trachea. The air will then come out from either our nose or mouth.

Gaseous Change

Between the air coming into the alveoli and going out, there is a special process called the exchanging of gases. Here is a little bit of background information on the alveoli.

- It has a surface area of about 70m(2)
- It has very thing walls to allow exchanging of gase.
- A huge blood supply
- There are 95,000 km of capillaries in our body which carry the oxygen to the muscles and the carbon dioxide out.
- Capillaries are about one-cell thick

There are blood capillaries all around these alveoli. Cells constantly move past each alveoli which is filled with air- and as each blood cell passes, the alveoli exchange exhausted oxygen filled air (carbon dioxide) and supply the cell with fresh oxygen. Each capillary will then bring the blood to various muscles and supply oxygen, enabling muscles to move.

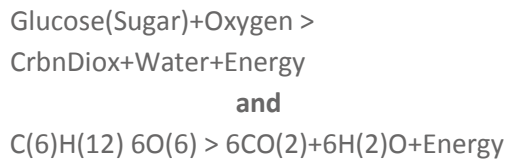


Cellular Respiration

Respiration is more than just breathing in and out- as much people don't know. Respiration is actually the converting of glucose to energy and it happens in every cell in the body. Once this energy is created, molecules are built up, muscles are enabled to move and the bodies temperature stabilizes. There are two types of respiration.

Aerobic Respiration:

Aerobic respiration is done when there is a large amount of oxygen available. The chemical and word equation for this is:



As seen in the equation, oxygen is used to break down glucose, and its outcome is carbon dioxide (which is put back out of the body through the mouth or nose), water and energy (used for the body).

Not only do mammals have this aerobic respiration, but so do plants. Plants use photosynthesis to gather oxygen and transform it into energy.

Anaerobic Respiration:

Anaerobic is the complete opposite of aerobic. It uses no oxygen at all and is used when no oxygen is available. (For example after vigorous exercise)

Here is the word equation:
Glucose(Sugar) --> Energy + Lactic Acid

Though anaerobic respiration is a very useful thing for the body, it doesn't produce as much energy as aerobic respiration. This is because as glucose is turned into lactic acid, the lactic acid acts like the water and it travels to the muscles. The muscles will start to ache because of this acid - and causes something called cramps.

Though anaerobic is very useful as it gives the organism more time to continue moving the muscles. After the body stops moving, the body will start to look for oxygen (have an oxygen debt) and the organism will start breathing heavily in order to get that oxygen back. High levels of CO(2) and lactic acid will cause the brain to, by instinct, increase the bodies pulse and breathing rate.

Source: <http://nrmrsgren.weebly.com/gr---growthreproduction.html>

Growth/Reproduction

Growth and reproduction are one of the most important stages in a life of an organism. Without growth, organisms won't be able to be born and reproduction won't be possible.

Reproduction

Reproduction starts from when the 'mother' egg is fertile.

As the sperm from the father of another organism enters, it swims through the cervix and into the Fallopian Tubes. The Fallopian Tubes are where the mother's eggs are stored. Millions of sperm race to be able to fertilize an egg- many which are lost.

Once a sperm makes it to an egg, it creates a protection around the egg which disables other sperm from going close to an egg. The egg which is fertilized is then called the zygote. The zygote consists of the cub's DNA, half from the father's sperm and another half from the mother's egg.

The zygote falls down the Fallopian Tubes and sticks to the lining of the uterus. As the egg turns fertile, the zygote starts to sub divide. This is the start of the production of cells. As the zygote is sub divided, it starts to create a ball of inner cells. The zygote, or mother cell, sub divides into many more cells and soon turn into daughter cells.

Further and further, cells keep dividing- each deciding what roles they would like to play in the organism. The sack of cells split into two parts, inner and outer. The inner cells are the embryo and the outer cells nourish and protect the embryo.

After a few more weeks, the embryo has three layers:

- Top layer: Also called the Ectoderm, turns into the skin layers
- Middle layer: Also called the Mesoderm, is primarily where the circulatory system and the bones, muscles kidneys are formed
- Bottom layer: Also called the Endoderm, is where the lungs, intestines and bladder are developed.

After more growth, the egg will turn into a young cub. Grizzly bears are known to give birth to two cubs at a time. Eggs can be fertilized by two sperm at the exact time, creating cub twins.

Growth

Growth is the replacing and creating of cells. Though growth is most commonly seen as change in height or looks, growth has already started from the start of when the egg is fertile.

Cells are continually replaced, repaired and created during the life cycle of a grizzly bear. The life cycle of the grizzly bear goes alike to a human life cycle due to both being living organisms.

Human Life Cycle

1.

Male sperm fertilizes females egg, called the zygote. The cell (mother cell) rapidly divides into cells (daughter cells) which later on turn into specialized parts of the body.

2.

The fetus grows in the uterus for 40 weeks until ready to be born.

3.

When the baby is born, the ages 1 to 2 are the toddler stages. Babies learn how to walk, talk and know more about the outside world.

4.

Further on, childhood is where habits and behaviors are developed. Children can easily grasp any habits which are displayed to them.

5.

Adolescence is during the age 12 and 18. Puberty kicks in and teenagers mature. Voices of boy and girls get periods. Adolescents are more mature, sexually aware and independent.

6.

Adulthood ranges from ages 18 and above. Humans are fully grown and independent. They don't rely on parents, and instead rely on life lessons. They reproduce children who will undergo the life cycle.

7.

The final stage of humans. The bodies of older men and women slowly wear out until death.

Grizzly Life Cycle

- 1.**
Male sperm fertilizes females egg, or the zygote, divide quickly creating specialized cells, organs and systems of the cub.
- 2.**
The fetus grows inside the mother's uterus. The cubs are born during hibernation period which ranges from the end of January - Early March.
- 3.**
Once the cub is born - it still continues to grow. Cubs are usually born with the length of 15cm-20cm and weight of 225g-400g. Cubs grow very quickly after birth due to the high concentration of fat in the mother's milk. The 'toddler' stage is during 1 to 2 years.
- 4.**
The childhood stage of the cub is during 3-4 years. This stage is where cubs start to learn more about the outside world. They learn habits and lifestyle.
- 5.**
Adolescence stage takes place between 4-5 years of age. Female cubs can now get reproduce cubs up until the age of 10. Grizzlies under adolescence grow fairly big. Grizzlies can now reproduce more cubs to undergo the cycle
- 6.**
From 5-10 years, cubs have grown into fully grown grizzly bears and gone into the adulthood stage. They are independent and can fend off for themselves.
- 7.**
From 10-25 years, grizzly bears have aged. Most female grizzlies are unable to reproduce. Grizzlies must spend the last 15 years of their lives getting ready to pass away.

Biotic and Abiotic factors

Organisms, as they grow and prosper, must rely on environmental factors. Things which enable them to do things such as grow and reproduce. There are two types of factors, abiotic (non-living) and biotic) living.

Abiotic and biotic factors are the complete opposites to each other but work the same way. They all rely on each other and are 'interrelated'. If one factor is unavailable, all the other factors turn unavailable as well - which is what makes organisms so reliant on them.

Abiotic

Abiotic factors are factors which are non-living.

Biotic

Biotic factors are factors which are living. Some factors are:

Relying on abiotic/biotic factors

Organisms rely on certain factors and are part of one system. If one factor is disrupted, the whole system fails.

For example: Without water, rock and soil will be useless. Without rock and soil, no plants can be grown. If no plants are grown, no vegetation can be eaten. Without vegetation, animals will starve and without animals and vegetation, no food can be eaten.

Each factor is reliant one or more parts of the system.

Water: Water is responsible for hydrating plants and animals. Water is also responsible for balancing out temperature.

Temperature: Certain temperatures are needed for organisms to function properly.

Rocks and soil: Rocks and soil are responsible as an area to grow plants and house certain organisms.

Sunlight: Sunlight is needed for plants to grow (photosynthesis), used for warmth and used for balancing out temperature.

Pathogens: Pathogens are responsible for killing certain organisms, but are also important for the well being of organisms.

Plants: Plants are responsible for the exchanging of gases (carbon dioxide to oxygen) and are responsible for feeding many organisms.

Animals: Animals are responsible for the nourishment of many organisms, causing them to gain vitamins, minerals and vital nutrition.

