

WHAT'S FOR LUNCH TOUR

Program Description - Theme: All living things need energy obtained through food to survive.

A variety of adaptations will be discussed to gain a better understanding of how animals are equipped to obtain suitable food and escape becoming food for someone else, while differentiating among those adaptations that are characteristic of carnivores, herbivores, and omnivores. Physical adaptations may include external and internal body parts, and sensory capabilities. Behavioral adaptations are often linked to particular physical adaptations.

Behind-the-scenes visits to the big barn and the predator diet storage will introduce visitors to some of the food provided to our animals at the zoo.

Objectives

Audience will –

- compare and contrast adaptations of carnivores, herbivores, and omnivores, including a discussion of eye and ear placement and differences in dentition (identify and describe the use of the canine, incisor, and molar teeth);
- explain beak adaptations for food eaten by different bird species;
- discuss how both prey and predators avoid detection and protect themselves from becoming food for someone else (camouflage, safety in numbers, etc.);
- discuss relationships within a food chain, including photosynthesis and the importance of scavengers;
- identify foods that carnivores and herbivores eat at the zoo.

Key Concepts

The Transfer of Energy

All living things need energy obtained from food to live, grow, and reproduce. Green plants make their own food using the energy from the sun through the process of photosynthesis. Herbivores obtain their energy by eating these plants. Carnivores eat other animals, and the energy is passed on in this food chain. Finally, scavengers and decomposers break down waste from dead things into usable nutrients to return to the environment for producers to use, and the cycle continues.

Adaptations for Obtaining Food and Staying Safe

Animals possess a variety of adaptations that help them obtain food and protect themselves. **A physical adaptation is a body feature** that is used as a “tool” that helps an animal survive. **A behavioral adaptation is something an animal does** to help it survive. Among the physical adaptations are the following:

- External – Eye/ear placement; teeth; beak; whiskers; feet; claws; outer covering; camouflage; prehensile parts; size of animal
- Internal – Ruminant stomach
- Sensory capabilities – Five senses, Jacobson’s organ

Among the behavioral adaptations are the following:

Being part of a group, e.g., pack hunting, safety in numbers, cooperative parenting; nocturnal vs. diurnal; predator vs. prey; carnivore, herbivore, omnivore; generalist vs. specialist; hibernates, migrates, or stays put in winter; communicates, scent marks; runs; jumps; digs, caches food; ruminates.

Differences in Ability to Adapt

Animals live in certain habitats because of their diet, physical needs, and/or ability to cope with weather conditions. Some individuals of the same species and/or other species survive better than others due to differences in their senses, hunting ability, quickness, etc.

Adaptations to changes in the environment develop over many generations and not within one animal's lifetime. Human actions now cause changes in the environment at a much faster pace than most species can adapt.

Key Terms: Carnivore, herbivore, omnivore, predator, prey, scavenger, Jacobson's organ, camouflage, nutrition, food chain, photosynthesis, producers, consumers, decomposers

Term	Definition
Adaptation	A characteristic that has developed over generations that helps an animal to survive in its habitat
Carnivore	An animal that primarily eats other animals
Herbivore	An animal that primarily eats plants
Omnivore	An animal that eats plants and other animals
Predator	An animal that kills and eats other animals, a hunter
Prey	An animal that is eaten by a predator, an animal that is hunted; an animal can be both predator and prey, for example small carnivores.
Scavenger	An animal that eats dead animals
Generalist	An animal that can eat a variety of foods and consequently is able to live in a range of habitats.
Specialist	An animal that has a limited diet and consequently more specific habitat needs.
Jacobson's organ	A body part inside the mouth of some mammals, reptiles, and amphibians. It helps the animal make sense of smells it gathers with its tongue.
Camouflage	Color and/or patterns on the outside of an animal that help an animal to blend in with its surroundings

Nutrition	Giving the body food that produces energy needed for growing healthy and strong
Nutrient	A substance found in food that allows an animal to survive and grow. Examples include carbohydrates, proteins, fats, vitamins, and minerals.
Food chain	The flow of energy from one living thing to another through the food consumed
Photosynthesis	The process through which green plants use sunlight to make their own food
Producer	Living things (green plants) that make their own food, or energy, through photosynthesis
Consumer	Living things (animals) that eat other living things to gain energy
Decomposer	Living things (bacteria, fungi, some insects, and worms) that are like garbage disposals for waste in nature by breaking down dead things, decaying flesh, or other waste, and sending the energy back into the soil and up the food chain
Nocturnal	An animal that is most active at night
Diurnal	An animal that is most active during the day
Crepuscular	An animal that is most active at dawn and dusk
Hibernation	When an animal spends the cold winter sleeping
Migration	When an animal moves from one area to another during the winter to find food and returns to its home area in the summer
Cache	To hide food
Ruminant	A plant-eating, hooved mammal whose stomach allows it to bring swallowed food back up into its mouth for more chewing
Cud	The food that a ruminant swallows and brings back up from its stomach into its mouth to chew again
Crop	An enlarged area of a bird's esophagus that serves as a storage area for food that has been eaten. The food can be softened there before it gets to the stomach.
Gizzard	Part of a bird's stomach that grinds up food
Grit	Small stones swallowed by birds to help digestion in the gizzard

Getting Started/Reminders

Selecting Content

Animals have many adaptations that help them survive in their habitat. A What's for Lunch program will focus on those adaptations that help the animals obtain food and protect themselves from becoming food themselves. As you plan your What's for Lunch program, limit yourself to a sampling of adaptations that differentiate carnivores, herbivores, and omnivores rather than the universe of adaptations the animal may have.

The goal is NOT to include everything you know about a particular species – or even every adaptation. Focus on a few key adaptations. Ask audience to identify features or behaviors of a species and discuss their adaptive value. Selecting a diverse set of animals will allow you to compare and contrast adaptations. Plan to spend about five minutes per species at a zoo habitat. Also, plan so that you have enough stops for the time allotted for your tour, with a few extras if you need substitutes. Note that a BIG Zoo Lesson tour lasts one hour and fifteen minutes and includes two behind-the-scenes visits. Consequently, you will need habitat stops in the zoo to fill about 45 minutes, divided into three 15-minute segments placed around two 15-minute behind-the-scenes stops. (See the What's for Lunch Behind-the-Scenes Summaries for more details.) A non-BIG Zoo Lesson tour lasts one hour and does not include behind-the-scenes visits.

Consider a range of the following:

- Carnivores, herbivores, omnivores
- Animals: Mammals, birds, reptiles, etc.
- Adaptations that help an animal obtain food and stay safe from others
- Physical adaptations: external and internal body parts, sensory capabilities
- Behavioral adaptations, including those that may be linked to particular physical adaptations

Introducing the Tour

To get your audience thinking in terms of food procurement, ask them questions such as "What do most animals spend most of their time doing in the wild?" (Other than the big cats, most animals spend the bulk of their time looking for food, while trying to avoid getting eaten!) Early on quiz them about the "vores" and engage them in a discussion comparing and contrasting the "vores." Referring to their own teeth is one way of helping to illustrate differences in various types of animal dentition. If you cover eye/ear placement of prey/predators early on in your tour, you can have the audience tell you whether or not each mammal you visit is a prey animal or predator by using just that information.

Explain to your audience that we have several animal kitchens/food prep areas, each with refrigerators, freezers, and sinks. (You may want to ask them why only one has a stove - animals eat their food raw in the wild and cooking it would result in the loss of some nutrients.*) Remind them that animals need a variety of nutrients to meet their basic needs. Following is a list of some of the zoo animals along with some suggestions of a few of the many ways you can use the animals to illustrate the concepts and terms listed above. Remember, these are only some suggestions. Be sure to consult the animal data sheets for more detailed information on their feeding habits and other pertinent information. Note: Zoo diets are also listed for most of the animals below.

*More information on the use of the stove: We do only have one stove, but there are several things that zookeepers cook. They boil eggs for birds, primates, and carnivores. Sometimes they cook beans, peas, rice, noodles, or vegetables for enrichments. They also boil water to make the gel diets made for use for primates, bats, tree shrews, and the prehensile-tailed porcupine. It comes in powder form, and keepers add boiling water. Then it goes into the cooler to set, like making Jello. The end product has complete diet nutrition (like a biscuit) in most recipes. It is soft like a dense custard and can be cut up into cubes of desired shape and size.

Potential Animals	Adaptations and Diets
Carnivores	
Wolf	Carnivore; note placement of eyes and ears; sharp teeth; cryptic camouflage; wolves are social (pack) and hunt their prey (which are often much larger than they are) as a well-coordinated team; like most large predators, they have "feast or famine biology" - kills may be several days apart and they can take advantage of hunting success by consuming very large amount of meat. Wolves locate prey with their incredible sense of smell, which is much better than ours. Sight and hearing are also good. The body is built for an energy-efficient trot and can keep going for long distances (cross country runner rather than sprinter like cats). Wild diet: large ungulates, small animals, carrion. Zoo diet: meat, whole prey items (rats, rabbits), some wild birds/squirrels they catch.
Arctic fox	Carnivore; note placement of eyes and ears; sharp teeth; senses of smell, sight, and hearing; seasonal variation in color of fur, cryptic camouflage; communal and nomadic, forming small groups to search for food together; build up fat reserves in the fall. When food is really scarce in winter, they have been known to scavenge polar bear kills. Wild diet: rodents, birds, reindeer, fish, invertebrates, carrion. Zoo diet: kibble, meat, rodents, fish, some fruit and vegetables.
Otter	Carnivore; note placement of eyes and ears; sharp teeth; senses of smell, sight, and hearing; countershading; webbed feet, tail used as rudder, dense under fur which traps air for insulation, large and abundant whiskers to compensate for other diminished senses underwater. These adaptations allow otters to be experts at catching fish; discuss the wide variety of prey this predator catches in addition to fish. Our otters are normally fed three or more times/day. In addition to their very high metabolism, the natural behavior of otters consists of a lot of time spent hunting/foraging. Consequently, we work to meet those behavioral needs by offering multiple feedings throughout the day and by using lots of different feeding strategies through enrichments. Wild diet: amphibians, fish, turtles, crayfish, and eggs. Zoo diet: fish (herring, capelin, smelt), carnivore meat diet, kibble, some fruits and vegetables for enrichment.
Bald eagle	Carnivore. Diurnal bird of prey, grab and carry prey in sharp talons, rip meat with hooked beak. Note placement of eyes; incredible eyesight – and hearing - for detecting prey at great distances (prey can be spotted from one mile in the sky); will scavenge, especially in the winter when food is scarce; will also migrate (a few miles or a thousand) in the winter to find ice-free water; will occasionally steal fish from other predators; will migrate to open water in winter to find food. This a great species to discuss food chains/webs - algae-insects-small fish-larger fish-bald eagle. Be sure to include photosynthesis. For upper elementary students, it's also a good time to discuss producers and consumers. Wild diet: Fish, mammals, reptiles, other birds, carrion. Zoo diet: fish, rodents, rabbits, bird-of-prey diet.
Big cats	All are carnivores ; note placement of eyes and ears; extremely powerful jaws and legs, sharp and powerful teeth; senses of smell, sight, and hearing; retractable claws; sprinters (not endurance like wolves); spend most of their day resting, conserving energy; have very elastic stomachs and can consume large amounts of meat when they make a kill (feast and famine biology). Zoo diet (all): feline meat diet (amount based on the animal's weight), large bones, some prey items (deer, rabbit, chicken, etc.); the big cats are fasted one day/week. Lions: The only social large cats (pride), females hunt together to take down large prey, mostly at night or in early morning; cryptic camouflage (contrast this with the disruptive coloration of zebras, one of their prey). Wild diet: large herbivores, birds, rodents, fish, eggs, reptiles, scavenge kills from other predators.

	<p>Amur tigers: Solitary. Has fur with color patterns than can function as either cryptic or disruptive depending on the color of the habitat, travel miles to hunt, stealthy, strong, can leap 8-10 meters, excellent swimmers and climbers. Wild diet: ungulates</p> <p>Snow leopard: Solitary, stalk and ambush prey from above in rocky terrain, long tail aids in balance, which can be a long distance, cryptic fur. Wild diet: wild sheep, goats, hares, marmots and other small mammals and birds.</p>
Giant anteater	Carnivore - Insectivore, eat termites and other insects. Long, curved, sharp claws, no teeth but flick long tongue that extends two feet out of mouth up to 150 times per minute when searching for food. Dig for bugs in logs, can run quickly if threatened, also good swimmer. If need to fight - will rear up on hind legs, use tail to balance, and use forelimbs and sharp claws for defense. Wild diet: ants, termites, grubs, eggs, carrion, fruit. Zoo diet: insectivore pellets, egg, avocado, insects.
Meerkat	Carnivore - Insectivore. Diurnal, sharp teeth, sense of smell, enlarged fore claws, dig for insects, live in groups, share sentry duty, use of alarm call. Wild diet: insects, will also consume small vertebrates, eggs, and plant matter. Zoo diet: insectivore pellets, meat, insects, eggs, some vegetables and fruit.
Banded mongoose	Carnivore - Insectivore. Diurnal, sharp teeth, sense of smell, curved claws, dig for insects, nomadic, live in packs, reproduction within pack is often synchronized and they care for young communally and even care for elderly or injured, bunch together to protect youngest in emergency, young may nurse from any lactating female. Wild diet: insects, will also eat wild fruits and small reptiles. Zoo diet: insectivore pellets, meat, mice, fruit, vegetables.
Magellan penguin	Carnivore. Beak for grabbing and eating fish; countershading; insulate bodies with down feathers and fat, oil glands to waterproof outer feathers, wings as modified flippers, webbed feet, solid bones; discuss why they are the only animals we hand feed (for both nutrition and disease prevention); swim and forage in open ocean and can dive up to 250 feet in search of food; parents defend the nest, eggs, and offspring, taking turns with incubation and feeding regurgitated fish to the young. Wild diet: small fish, squid, crustaceans. Zoo diet: fish (capelin and herring).
Gila monster	Carnivore, venomous. Stout limbs, heavy claws, grooved teeth that channel venom from modified salivary gland into prey as they chew on them, Jacobson's organ; can go months without eating due to fat storage in tail, spend most of their lives in burrows underground. Wild diet: small animals, eggs. Zoo diet: mice.
Snakes	<p>All are carnivores. Tongue used for taste/smell, Jacobson's organ, loosely hinged jaw for swallowing large prey, cryptic camouflage. Wild diet: small animals. Zoo diet: rodents offered weekly or every two weeks. Digestion is slow and temperature dependent.</p> <p>Massasauga rattlesnake Inject venom</p> <p>Other snakes Constrict</p>
Herbivores	
Kangaroo	Herbivore, graze. Eye/ear placement, grinding teeth. Gray kangaroo Wild diet: grasses, forbs, leaves, tree bark, and shrubby browse. Zoo diet: specialized pellets, hay, greens, some fruits and vegetables

	Red kangaroo: Excellent vision and hearing, can go a long time without water by consuming moisture-filled succulent plants, powerful hind legs for protection, hopping speed 40 mph, upper limbs used for eating, self-defense, and grooming. Wild diet: green grasses and flowering plants.
Bongo	Herbivore, ruminant, chew cud, are grazers and browsers. Eye/ear placement, grinding molars, large, broad ears, cryptic or disruptive camouflage (depending on circumstances), long prehensile tongue to pull leaves off, use horns to break and pull on high branches; form herds. Wild diet: leaves, flowers, twigs. Zoo diet: herbivore pellets, alfalfa hay, browse, greens, some vegetables.
Rhinoceros	Herbivore, browser. Placement of eyes/ears, grinding molars, prehensile lip, vision poor but hearing and sight very good, two horns, large size, short & stout limbs; symbiotic relationship with oxpeckers and egrets (birds eat bugs from rhino or grass it stirs up while rhinos get alarm call warning of possible threat. Adult rhinos have no predators but humans. Wild diet: woody and herbaceous plants, acacia is a favorite. Zoo diet: hay, browse, fruits, vegetables, grain pellets.
Farmyard Animals	All these animals are herbivores, with the exception of two species, (have your audience guess which two are not), which are omnivores (chickens and Guinea hogs); note placement of eyes and ears on all the herbivores; grinding molars; goats, cows, and alpacas are ruminants; Sicilian burros are not. Zoo diets: varies somewhat depending on animal, but for most it is hay, grain/pelletized food.
Patagonian cavy	Herbivore, graze. Long ears and gnawing incisors that continuously grow and grinding molars. Note placement of eyes and ears; cryptic camouflage. They can walk, gallop, and flee at high speeds, springing four-legged off ground (can run up to 45 mph); live and graze in open habitat, during pupping they live in large groups. Note: You can talk about predators of the Patagonian cavy (jaguars, eagles) and lead into a discussion of predator/prey and food chains. Wild diet: grasses, cacti, seeds, grains, flowers. Zoo diet: herbivore pellets, rodent chow, fruits and vegetables.
Cape porcupine	Herbivore. Good hearing, gnawing incisors that continuously grow and grinding molars. Note placement of eyes and ears; acute hearing; quills - to raise to look threatening and to back into and embed in predator. Wild diet: roots, tubers, bulbs, fallen bark and fruits, can be found eating carrion. Zoo diet: pellets, root vegetables, browse, some fruit, other vegetables.
Chuckwalla	Primarily an herbivore but will eat insects if necessary. Cryptic camouflage, seek safety in crevices, can inflate lungs to make it very difficult for predators to drag them out of hiding, hibernate. Wild diet: fruit, leaves, buds, flowers. Zoo diet: produce.
Omnivores	
Primates	All our species are omnivores with sharp canines and grinding molars, and diurnal. Eyes facing forward (binocular vision) and long tails for balance each support a primarily arboreal lifestyle. Being social provides multiple eyes, ears, and noses to detect predators and food. Zoo diets: primate biscuits (of different sizes) and produce. Spider monkey's prehensile tail frees hands for foraging for fruit and grabbing insects. Very agile, highly social, form groups, bark when threatened and throw branches at predators. Wild diet: ripe fruit, nuts, seeds. Zoo diet: primate biscuits, leafy greens, vegetables and fruits. The tamarins are diurnal and arboreal, forming groups (which help detect predators), have claws for searching crevices, bark, and plants for insects. Wide variety of calls for communication, including related to food and predators. Wild diet: insects, fruits, flowers, nectar, small animals, eggs, tree exudates (sap, gum, latex). Zoo diet: callitrichid gel, fruit, vegetables, insects, flowers.

	Ring-tailed lemurs can use their hands to hold food. Wild diet: leaves, flowers, insects. Zoo diet: biscuits and produce.
Red pandas	Omnivore, herbivorous carnivore, scientifically classified as a carnivore but primarily eats bamboo. Sharp incisors and canines, flat molars, sharp claws, countershading (red top with lichen in tree, bottom black with shadows in tree), elongated wrist bone acts as thumb for grasping bamboo. Arboreal, active at dawn, dusk, and night, sleep a lot to conserve energy due to lack of nutrients received from bamboo, can rotate ankles to climb head-first down a tree to keep an eye out for predators and to flee quicker. Wild diet: bamboo, fruits, roots, grasses, insects, bird eggs. Zoo diet: bamboo, leafeater biscuits, some fruits for training.
Emu	Omnivore, disperse seeds. Wedge-shaped beak, forage, swallow small stones to help digestion in gizzard, strong legs, solid bones, can swim, can run up to 30 mph, kick as defense, diurnal but wake up often to drink water and watch for predators. Wild diet: fruits, seeds, plant shoots, small animals, and insects. Zoo diet: ratite pellets.
Green aracari	Omnivore, disperse seeds. Large, serrated beak to grip and gather fruit (gulp down whole), can hop on branches with thick foliage or climb, using zygodactyl feet (like parrots), to search for food. Wild diet: fruit and insects. Zoo diet: soft-bill pellets, fruit, occasional insects.
Raven	Omnivore. Strong, thick multipurpose beak, intelligent, able to mimic sounds, cache food, solve problems. They are wary of approaching new kinds of carrion, their favorite food. They have been known to observe other birds at the food item to make sure there is no danger. Wild diet: small mammals, amphibians, fish, other birds, eggs, insects, carrion, plant material. Zoo diet: mice, insects, dry parrot pellets, hard-boiled eggs, and some fruits and vegetables.
Box turtle	Omnivore. Sharp, horny beak, forage most of day; hibernate; shell, high-domed carapace and hinged plastron, can retract head, tail, and limbs into shell and shut completely. Wild diet: fruits, mushrooms, flowers, carrion, slugs. Zoo diet: vegetables, fruits, moistened turtle pellets, earthworms.

Concluding the Tour

Restate your theme and consider the objectives: "Today we learned that all living things need food to get the energy to live and grow. Different animals eat different food. Some are carnivores, some are herbivores, and some are omnivores."

Ask a couple of review questions:

"Can someone tell me what a carnivore eats? Can you give me an example of a carnivore in the zoo? What is one adaptation that helps it to catch and eat meat?"

"What is an herbivore? What is an example of an herbivore in the zoo? What is an adaptation that helps it eat plants?"

"What is an omnivore? What is an example of an omnivore in the zoo? What adaptations help it eat both plants and animals?"

"What is an adaptation that would help an animal protect itself from being eaten by predators?"

"What is something that you learned about how the zoo provides food for the animals?"

"What is something you have heard today that you want to share with your family or friends?"

"Thank you for coming! Enjoy the rest of your visit."