



LOOK INSIDE

Jana Albrechtová • Radka Píro • Lida Larina







GREAT WHITE SHARK





DIGESTION AND EXCRETION

Eating and digesting is a long and complicated process in humans, starting with the chewing of food in your mouth and usually ending in the toilet. Every living creature must receive food; otherwise, it would not have enough energy to grow and to survive.



Salivary glands

Jaws and teeth

• tear, chew, and break food into smaller parts.

Tongue

It tastes food and moves it into the throat. Thanks to the taste buds on its surface, we know straight away if the food in our mouth is good to eat or not.

Stomach

The stomach produces digestive juices (acids) that help to break down food into small parts which are easy to digest.

Large intestine

DID YOU KNOW ...?

Saliva helps to break down food in your mouth into smaller parts and to swallow it. When you have too little water in your body, you are also low on saliva, which makes swallowing difficult.

MOON

DOMESTIC CATTLE



SIAMESE CROCODILE



JELLYFISH



HONEY BEE



A SEA PREDATOR



Sharks like to eat fish, sea mammals, and turtles. Sometimes they even catch birds.

Some shark species can turn their stomach inside out and regorge its contents, getting rid of the undigested bones.

A LONG, LONG TONGUE

A woodpecker's tongue grows out of its right nostril and winds around the entire skull. Its end is covered with bristles, or tiny hooks, allowing the woodpecker to get at the larvae hidden deep in tree trunks.

An organ called the crop softens and moisturizes food to make it easier to digest.

The spiral valve

in the intestines

into which the

absorbed. As

a result, the

efficiently.

digested food is

enlarges the surface

nutrients from food

can be used more

In the first, glandular stomach, food is digested chemically with digestive juices.

Hedgehogs are

insect-eaters. As

do not need an

intestine.

appendix on their

insects are easy to



The second, muscular stomach crushes and grinds the partly digested food. This is also done thanks to sand and small stones that birds swallow for better digestion.

Their intestines

are quite short

and compact.

digest, hedgehogs

Hedgehogs eat earthworms, caterpillars, snails, and sometimes also small frogs and lizards.

RODENT TEETH KEEP GROWING

time to time.

A hare's teeth grow throughout its life. This is necessary because the teeth keep rubbing off when eating grass, twigs, and sprouts.

Herbivorous animals have long intestines which thoroughly digest the not-toonutritious grass.

203

In the long appendix, filled with lots of beneficial bacteria, food is broken into as small parts as possible, making it easier to digest.

DIGESTION AND EXCRETION

Eating and digesting is a long and complicated process in humans, starting with the chewing of food in your mouth and usually ending in the toilet. Every living creature must receive food; otherwise, it would not have enough energy to grow and to survive.



AN INSECT

adapted to digest

apples, mushrooms,

pears, or grapes, as

people sometimes

imagine. It eats a bit of

plant food only from



Salivary glands

Jaws and teeth

• tear, chew, and break food into smaller parts.

Tonque

It tastes food and moves it into the throat. Thanks to the taste buds on •••• its surface, we know straight away if the food in our mouth is good to eat or not.

Stomach

The stomach produces digestive • juices (acids) that help to break down food into small parts which are easy to digest.

DID YOU KNOW...?

Saliva helps to break down food in your mouth into smaller parts and to swallow it. When you have too little water in your body, you are also low on saliva, which makes swallowing difficult.



shorter intestines than herbivores because animal food is easier to digest than plant products.

Moon jellyfish, or saucer jellies, eat and tiny fish.

Eventually, nutrients are absorbed in the small intestine and rectum.



Carnivorous animals have

The reticulum catches bigger, unchewed parts of food, sending them back through the rumen to the mouth to be chewed some more.

In the omasum, the food undergoes more grinding and crushing.

Crocodiles swallow

help grind food in

their stomach and

move it on to the

A jellyfish's mouth

They use tentacles

is in the bottom

part of the bell.

to catch food,

paralysing the

prey with their

stinging cells.

Part of the nectar

travels into the

long stomach

takes place.

where digestion

intestines.

little stones that

are thought to

A SERIES OF STOMACHS

A cow has four stomachs called the rumen, reticulum. omasum, and abomasum.

In the rumen, swallowed grass is processed, mixed and digested with the help of beneficial microorganisms.

EFFICIENT DIGESTION

A crocodile can digest parts of large animals including their bones, shells, or hoofs.

This efficient digestion is ensured by digestive juices that are the most acidic in the whole animal kingdom.

USEFUL FOR EATING AND MOVING

The gastrovascular cavity in jellyfish is called the coelenteron and serves not just for digestion but also for pushing out water. This enables the jellyfish to move in the sea.

BEE FEEDING

Honey bees feed on pollen and nectar.

Nectar is sucked into an enlarged part of the digestive tube called the crop or honey stomach.

TILES

WHAT DO YOU EAT?



Animals are divided into several groups according to the food they eat. Herbivores eat only plant food. Carnivorous animals like all kinds of meat but they are not fans of vegetables. There are also **omnivorous** animals who like a bit of everything ... just like humans.

DID YOU KNOW...?

Nematodes and tapeworms eat in the simplest way of all; they can do without a digestive system altogether. How? They absorb food across the surface of their body.



SHOWING YOUR TEETH

carnivore's herbivore's tooth tooth

The shape of teeth depends on the type of food each animal eats. Carnivores need incisors to tear meat, whereas herbivores mostly use their robust molars to chew plant food. Some animals grow teeth throughout their lives because their teeth keep rubbing off when they eat. Just think of hares or rodents. Shark's teeth are replaced with new ones every time they fall out.



While the final part of the human intestine is the rectum, which lets the undigested parts of food out as "poop", other animals such as birds have a different solution. Their digestive system does not end with the rectum but with the so-called **cloaca**. The cloaca is also the ending of the excretory system, and often of the reproductive system as well. That is why birds' poop and pee are actually the same thing. You may have noticed the white coating on birds' poop - that is in fact the pee. The same works for animals such as turtles, frogs, or snakes.



SOME HAVE A MOUTH. **OTHERS HAVE A PROBOSCIS**

Depending on their favourite food, each group of animals has a different organ at the beginning of their digestive system. Humans have a mouth with teeth, a tongue, and saliva. Gnats have a proboscis to suck blood. Chameleons and some frogs have a projecting tongue to catch insects.



A butterfly can enjoy nectar from flowers thanks to its licking proboscis, neatly rolled in during flight so it does not get in the way. Poisonous snakes kill prey with their venom fangs.

WHERE DOES THE REST GO?

13

WHAT HAPPENS IN YOUR BODY ↓

The stomach produces **digestive juices** that break down food into small parts. The stomach wall is covered with a protective coating that makes sure the organ is not damaged by stomach acids. Food spends most of its time in the intestines, where it is effectively digested. Sugars, fats, proteins, vitamins – anything the body can use – enter your bloodstream through the intestinal walls.

There are useful helpers inside the digestive system that are too tiny to be seen - bacteria. Without them, no creature would be able to process food properly and to get as much energy as possible from it.

DID YOU KNOW...?

There are animals called coelenterata that live in the sea. They have just one opening, both for receiving food and regorging the undigested scraps. Their digestive cavity is called the **coelenteron**, and you can see it in jellyfish.

EARTHWORM





GIANT PACIFIC OCTOPUS



BLACK GARDEN ANT

15



CIRCULATORY **SYSTEM**

Blood carries nutrients and oxygen to all parts of the body - something that all living creatures need to stay alive. Blood also removes any waste products. Humans have a closed circulatory system consisting of two loops: pulmonary and systemic.

The heart

is the muscle that pumps blood, sending it throughout our bodies and ensuring its circulation.

Pulmonary circulation

Blood travels from the heart to the lungs, where it picks up oxygen. Then it returns to the heart.

Systemic circulation

Oxygenated blood is pumped into the big systemic circulation. That means it flows to all the other parts of the body, bringing oxygen where it is needed. After that, blood flows back to the heart to get more oxygen.



DID YOU KNOW ...?

Adults have 4 to 6 litres of blood. The body cannot lose more than a half-litre of blood.

GREAT TIT

AFRICAN BUSH ELEPHANT



GOLDFISH









TYPICAL BLOOD-RED COLOUR

Earthworms have red blood thanks to substances similar to haemoglobin, which is present in human blood.

The blood circulates in a closed system through dorsal and ventral vessels.



The blood flowing through a network of capillaries just under the skin gives the earthworm its typical colour.

What may look like five hearts are in fact enlarged vessels.

CIRCULATORY **SYSTEM**

Blood carries nutrients and oxygen to all parts of the body - something that all living creatures need to stay alive. Blood also removes any waste products. Humans have a closed circulatory system consisting of two loops: pulmonary and systemic.

The heart

is the muscle that pumps blood, sending it throughout our bodies and ensuring its circulation.

The blood in mammals is red, thanks to a protein called haemoglobin that can carry oxygen.

HOW BLOOD

FLOWS UPWARDS

Under every spot, a dense network of vessels lets out extra body warmth. That is how giraffes cool down.

Blood can flow up remarkably high through strong and elastic arteries. A rich network of vessels then distributes blood equally throughout the brain.



From the brain, the blood flows into partitioned jugular veins in the neck. When the giraffe bends down, the partitions prevent the blood from flowing back to the brain, thus protecting it from damage.

Pulmonary circulation

Blood travels from the heart to the lungs, where it picks up oxygen. Then it returns to the heart.

THE OWNER OF THREE HEARTS

An octopus's blood is blue, thanks to a copper rich protein called hemocyanin.

An octopus has got three hearts. The main heart sends oxygenated blood throughout the body.

The other two hearts pump blood through gills, where it picks up oxygen.



The colder the water is, the more slowly the octopus's hearts beat.

OPEN CIRCULATORY SYSTEM

Instead of blood, ants have a liquid called haemolymph flowing in their bodies.

Haemolymph is not sealed away in vessels – it spills freely between the organs. Haemolymph transports nutrients and other substances throughout the body.



A tube-like vessel on an ant's back is a bit like our heart.

Systemic circulation

Oxygenated blood is pumped into the big systemic circulation. That means it flows to all the other parts of the body, bringing oxygen where it is needed. After that, blood flows back to the heart to get more oxygen.



DID YOU KNOW ...?

Adults have 4 to 6 litres of blood. The body cannot lose more than a half-litre of blood.





Fish are what we call cold-blooded animals. It means their body temperature depends on that of their environment.



Only oxygenated haemolymph runs through the heart, which has two parts – one ventricle and one atrium. The liquid spills freely throughout the body.



A bird's heart, just like mammals', is made of four chambers.



When it gets hot, elephants flap their ears, cooling down blood in their ear vessels. It takes less than an hour for all the blood to flow through those

The heart pumps

comes oxygenated

The oxygenated

blood then flows

through arteries to

all the organs inside

the body, returning

afterwards to the

heart.

the blood that

from the gills.

A GIANT WHO NEVER SWEATS

Elephants do not sweat, which is why they must cool down through a complex system of vessels in their huge ears.

ONE CIRCULATORY SYSTEM IS ENOUGH

Unlike mammals or birds, fish have just one blood circulatory system.

The fish blood contains substances that prevent the fish from freezing even in ice-cold water.

HAEMOLYMPH INSTEAD OF BLOOD

system is not closed like that of mammals or birds, but open.

A bluish-coloured haemolymph carries nutrients and oxygen throughout the body.

The haemolymph is oxygenated in a so-called lung bag.

Flying takes a

faster to carry

enough oxygen

into the muscles.

lot of energy, so

blood must flow

CAPABLE HEART

The tit's heart is relatively large given the size of its body and beats faster than the heart of same-sized mammals.

HOW IT WORKS FOR OTHERS

Invertebrate animals (those that do not have a spine), such as snails or earthworms, have a liquid called haemolymph instead of blood inside their bodies. Its components are different, but it plays the same role as blood in vertebrates. Invertebrates have an **open** circulatory system: the haemolymph spills freely everywhere in the body, so the organs and tissues bathe in it, receiving oxygen and nutrients directly. Insects have a different system: they receive oxygen through tiny tubes called tracheae that send it straight to their tissues.

HOW BLOOD TRAVELS



The blood vessels that bring oxygenated blood from the heart to the body tissues are called **arteries**. The vessels that transport blood back to the heart are called **veins**. The veins carry mostly deoxygenated blood, which removes carbon dioxide from our body – it travels to the lungs, and we breathe it out.

BLUE OR RED?

The colour of blood, or haemolymph, depends on its contents and the type of protein it has. Haemoglobin - red, iron rich, the most common blood protein in nature; Hemocyanin - blue, copper rich protein, typical in molluscs and crustaceans.

Working copy



All vertebrates - birds, reptiles, and mammals - have a **closed circulatory** system. It looks like a huge network of bigger and smaller vessels through which blood flows. This blood flow is ensured by the heart – a pump able to send blood throughout the body.

HOW THE HEART WORKS



The heart is the most hard-working muscle in the body of vertebrates. No wonder - it can never stop! The heart sucks in blood to send it to the lungs, where it picks up oxygen. The oxygenated blood goes back to the heart to be sent throughout the body, or it flows directly to different parts of the body through blood vessels. This circulation is then repeated all over again.

DID YOU KNOW...?

The biggest heart in the whole animal kingdom is that of the blue whale. This sea mammal is also the largest animal on earth.



A WEIRD SNACK

Besides having lots of functions in the body, blood also serves as food for some creatures. You will surely think of mosquitos or ticks, but there are many others. A bat species that drinks blood is called the vampire. There are also some blood-thirsty species among fish and birds.



WHAT IS BLOOD MADE OF?

In vertebrates, blood is made of **red** blood cells that can carry oxygen. It also contains an army of white blood cells, attacking all the unknown and dangerous strangers that may cause infection. Platelets help blood to clot when you have a cut or wound.



Blood also cleans the body, removing all the waste products. It transports them to the kidneys, the two bean-shaped organs that catch all waste from blood, expelling it from your body in urine.

Written by Jana Albrechtová, Radka Píro Illustrated by Lida Larina

Have you ever wondered how animals' bodies work? How is it that birds can fly and fish can breathe underwater? How, and why, is herbivores' digestion different from that of carnivores and how can animals use their senses? Explore the amazing diversity of the animal kingdom and compare the body constructions of various animal species. What's more, you can contrast the workings of each system with that of humans!





© Designed by B4U Publishing, member of Albatros Media Group, 2021. All rights reserved.