



unit two

Human Body Detectives Go to School Elementary Curriculum

The Immune System

HBD, a trip through the immune system
activities and worksheets

human body detectives

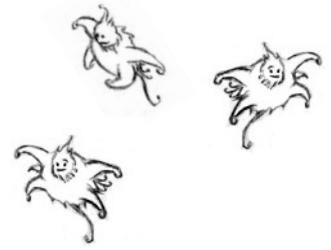
BATTLE WITH THE BUGS



Merrin and Pearl's cousin Max is sick, threatening everyone's Mexican holiday. This time the girls find themselves in Max's body, witnessing firsthand the immune system in action. They befriend a white blood cell warrior who leads them into battle against the offending bacteria...

Dr. Heather Manley, N.D.

A Quick Voyage Through the Immune System



Human beings live with and are surrounded by billions of **bacteria** and **viruses**. Some are good and help our bodies, but some make us sick. Lucky for us — and not so lucky for the bad bugs — getting into the human body is not easy. These bug invaders will try to get through in many ways: through the skin, nose, mouth, ears or eyes. However, the body's immune system has incredible defense mechanisms designed to keep the invaders out: the skin is thick and hard to penetrate; the nose has **cilia** (fine little hairs) and goopy mucus that trap dirt and bugs; the eyes have tears that wash them away; and the mouth produces saliva and other chemicals the bugs do not like. These are the immune system's first line of defense.

Occasionally, bug invaders do break through this line of defense and enter the body, and when that happens the body works in even more amazing ways to protect itself. The brain sends an alert signal out to the immune system. This signal triggers **inflammation**, which causes the **blood vessels** to dilate and increase blood flow. When this happens, a team of **white blood cells**, or **leukocytes** (macrophages and lymphocytes), flocks to the scene of the crime. There are many types of white blood cells, including **macrophages**, **lymphocytes**, **basophils**, **neutrophils**, and **eosinophils**. The different white blood cells all have different jobs and come from different areas in the body such as the **thymus**, **spleen**, or **bone marrow**. They can travel through the blood but usually travel through a special system, efficiently designed just for them, called the **lymphatic system**.

Once at the invasion site, the white blood cells get to work doing their special jobs. For example, the macrophages will eat up the invaders, and the lymphocytes will not only help destroy the invaders but will remember and recognize them, in case a similar bug comes in for a future attack. White blood cells are like little warriors floating around in your blood waiting to protect you from any virus or bacteria enemies.

To help the immune system stay strong and healthy, it is very important to eat healthy, balanced meals full of colorful fruits and vegetables, and not too much sugar. The invaders love sugar as it makes them grow stronger and even multiply. It is also essential to get plenty of sleep, have fun, laugh a lot, and be happy!

Human Body Detectives: Know, Want to Know and Learned



The immune system is the body system that defends people from bacteria and viruses (all germs, really!) every day and all day long. The immune system does a fantastic job keeping our bodies healthy! Sometimes bad germs get through the immune system but that just makes it stronger!



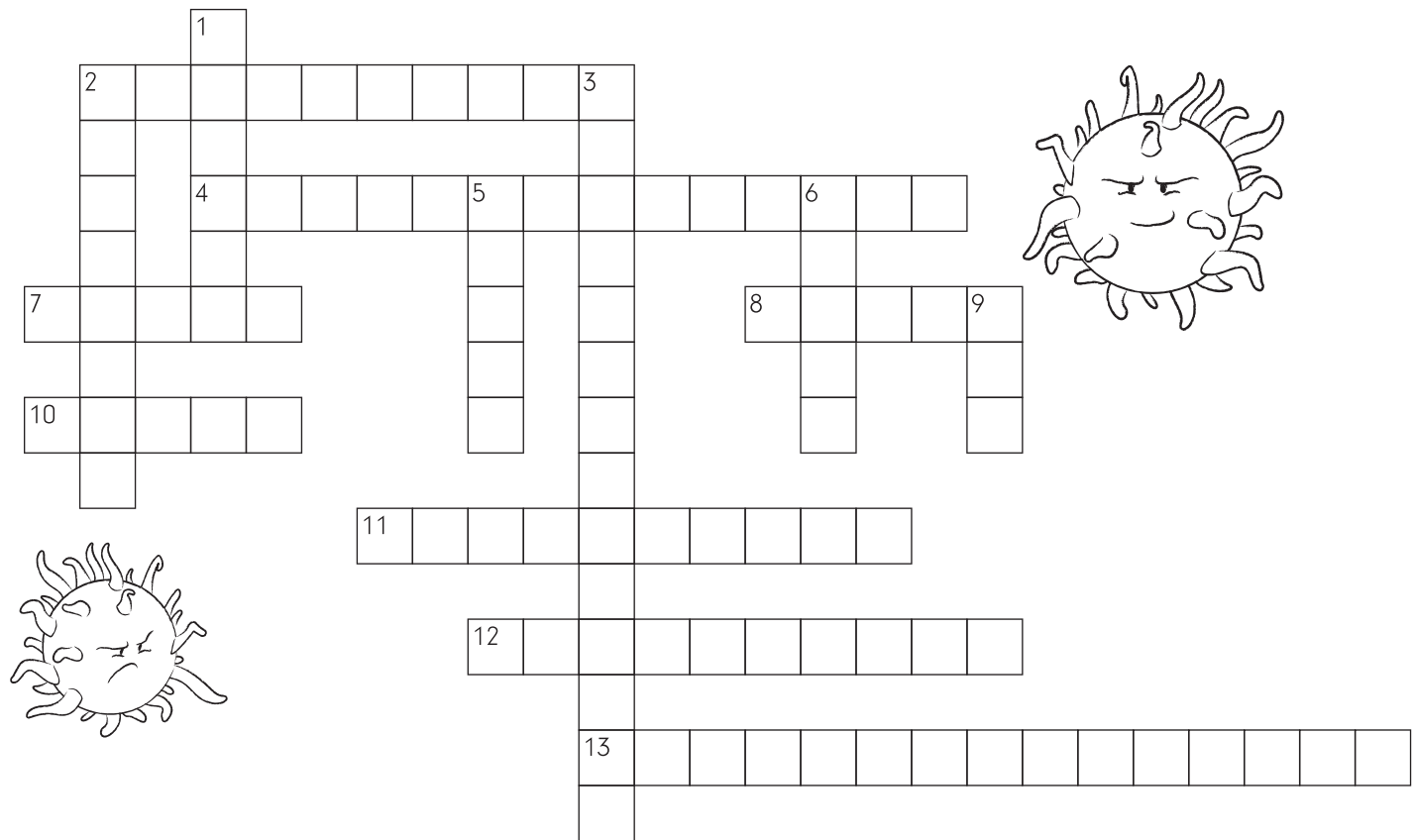
What I **KNOW** about the immune system:

What I **WANT TO KNOW** about the immune system:



What I **LEARNED** about the immune system:

Immune Crossword



ACROSS

- 2** I am inside your bones. I give life to blood cells, including white blood cells.
- 4** I am the fancy or scientific name for your ear.
- 7** I make the body really hot to destroy bugs and germs!
- 8** I am goopy and sticky. I can be found in the nose and other parts of the body. One of my jobs is to trap bacteria and push it out of the body.
- 10** I am not a part of the immune system, but I am very important in the digestive system. One of my jobs is to store nutrients.
- 11** I am a white blood cell and part of the immune system's team of fighters. I think of myself as the one in command!
- 12** My job is to grab, suck in and kill any unwanted bug, germ or creature in the body. I have many arms to help me. The detectives called me "Quickster."
- 13** I am similar to the blood vessels, but instead of blood traveling through me, white blood cells do.

DOWN

- 1** I am fast! I can travel at 100 mph!
- 2** I can cause illness in the body. I love to eat sugar, as it helps me be powerful and strong.
- 3** There are many different types of me and we all work as a team to help keep your body from getting sick.
- 5** I am similar to hair, but I do not grow too long. I sway back and forth to push unwanted things out of the body.
- 6** You learned about me in The Lucky Escape, and Quickster just missed me on his way to the crime scene!
- 9** The newest detective!

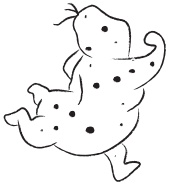
Possible Answers: bacteria, bone marrow, cilia, eustachian tube, fever, leukocytes, liver, lymphatic system, macrophage, mucus, Sam, sneeze, uvula, white blood cell

Immune Commonyms

"What is a Commonym?" Merrin, Pearl and Sam wondered.

"Ohhh, it looks like words that all share something in common!"

Can you figure these out? We will help you with the first one....



1. macrophage, lymphocyte, eosinophil
...they are all white blood cells!



2. eggs, toast, juice

3. digestive, immune, circulatory

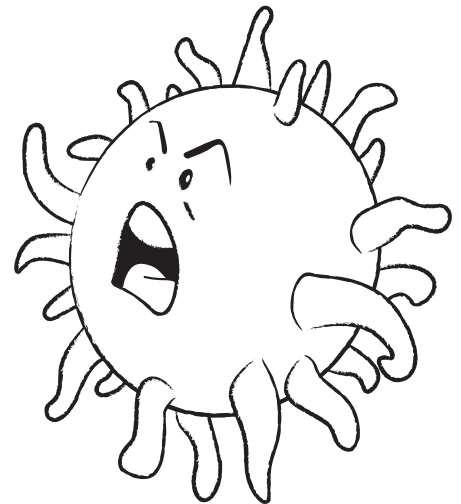
4. teeth, tongue, uvula

5. cilia, mucus, achoo!

6. bacteria, virus, invaders

7. asparagus, broccoli, kale

8. brilliant, adventurous, learners and explorers!



Immune Mystery Story



Help Quickster find the culprit!

Is it Mr. Jim Germ, Miss Bacteria Beauty or Mrs. Vicky Virus?

Use the clues below to help figure out who the bad guy (or gal) is.

Mr. Jim Germ
goopy and slow

Miss Bacteria Beauty
beautiful and fast

Mrs. Vicky Virus
sneaky and fast

Quickster, our friendly macrophage and part of the white blood cell immune team, senses an invader in his human host's body.

Unsure of where to start his search, he discovers what looks like a trail of goopy, smelly, sticky mucus. *This must be my first clue*, he says to himself! As the goop and smell becomes more overwhelming, he sees a sudden flash. It's quick and fast, but he is sure it's something. Quickster picks up some speed and is now in *hot* pursuit. Actually, hot is right! It's getting very warm. The heat is a sure sign that an invader is attacking – the body has created a fever. He must work fast to help out. As he turns a corner he sees the uvula ahead. It looks like something is hiding behind it! Oh, so sneaky! Whatever it is suddenly takes off and Quickster sees it has long legs. He finds it hard to keep up after it. But soon, Quickster lives up to his name and moves at lightning speed to catch up to the thing and grab it. As he turns it around in his arms, he sees how beautiful she is! How could he destroy such beauty? But there is no choice. His job is to help save his human from foreign invaders, so he sucks up his captive with a big, happy gulp.

Do you know whom Quickster had to eat up?

Great detective work!



Human Body Detectives Ask

These facts were news to Merrin, Pearl and Sam, so they wanted to share them with you.

Did you know that...

- ⑥ laughing lowers levels of stress hormones and strengthens the immune system?
- ⑥ 6-year-olds laugh an average of 300 times a day and adults only laugh 15 to 100 times a day?
- ⑥ it is impossible to sneeze with your eyes open?
- ⑥ a cough releases an explosive charge of air that moves at speeds up to 60 mph?
- ⑥ a sneeze can exceed the speed of 100 mph?
- ⑥ every square inch of the human body has an average of 32 million bacteria on it?
- ⑥ approximately 75% of the immune system is located in the digestive system?
- ⑥ white blood cells are continually on the lookout for signs of disease?
- ⑥ white blood cells have a rather short life cycle, living from a few days to a few weeks?
- ⑥ a drop of blood can contain anywhere from 7,000 to 25,000 white blood cells at a time? If an invading infection fights back and persists, that number will significantly increase.
- ⑥ your white blood cell count rises with infection as your body creates more "soldiers" to kill the disease?
- ⑥ an immunologist is a doctor who specializes in the immune system?
- ⑥ poor nutrition can weaken the immune system?
- ⑥ people who exercise have healthier immune systems?



Immune Search



M	L	T	L	D	Q	A	Z	A	D	J	B	Q	E	B
E	A	R	H	W	M	F	I	V	L	R	F	B	W	O
V	Z	C	K	Y	B	D	V	R	C	U	U	Q	R	N
M	K	B	R	T	M	M	X	I	E	T	V	L	W	E
E	T	Y	C	O	K	U	E	L	N	T	Y	U	G	M
G	S	M	P	G	P	H	S	A	Z	M	C	N	J	A
N	U	U	Z	G	W	H	I	Q	P	O	I	A	O	R
I	R	C	Z	N	C	H	A	H	T	Z	U	F	B	R
H	I	U	M	I	C	E	O	G	E	W	G	U	D	O
G	V	S	L	A	R	C	A	E	E	C	S	V	H	W
U	J	I	T	A	Y	Q	N	R	E	V	E	F	Q	A
O	A	S	E	T	Z	S	I	N	V	A	D	E	R	K
C	U	S	E	W	H	W	W	B	W	R	D	S	W	D
E	O	N	I	M	M	U	N	E	S	Y	S	T	E	M
N	J	V	Q	W	Y	H	U	E	G	G	P	C	P	C

bacteria
bone marrow
cilia
coughing
ear
eustachian tube
fever
immune system
invader



leukocyte
lymphocyte
macrophage
mucus
nose
sneezing
thymus
uvula
virus

Merrin, Pearl & Sam Wonder...

Help Merrin, Pearl and Sam find out where in Max's body the invaders are attacking. Replace every letter in the puzzle below with the letter that follows in the alphabet.

— — — — — — — — — — — — — — — —
D T R S Z B G H Z M S T A D



— — — — — — — — — — — — — — — —
F N N O X F Q D D M L T B T R F N N

— — — — — — — — — — — — — — — —
P T H B J R S D Q

— — — — — — — — — — — — — — — —
V G H S D A K N N C B D K K R

— — — — — — — — — — — — — — — —
A Z B S D Q H Z



Macrophage

A macrophage sucks in and kills any unwanted and invasive things or creatures in the body.

See how many different words you can make using the letters in the word "macrophage." Can you fill up the entire page with words?

rope



map

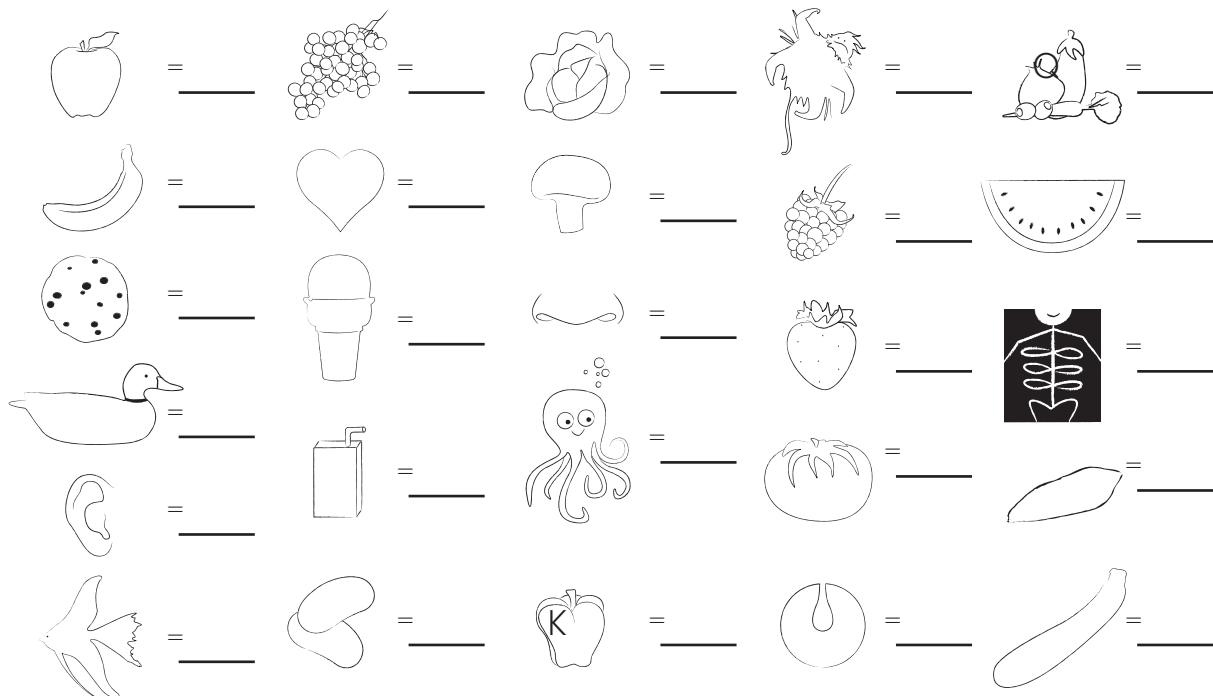


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The HBD Code

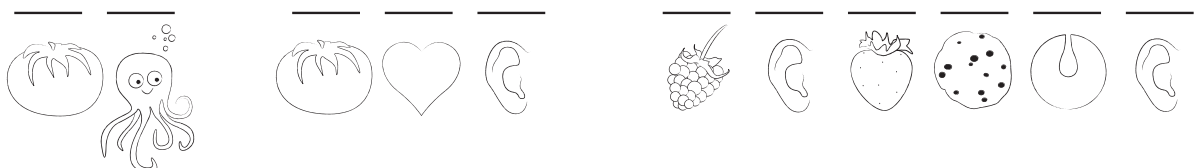
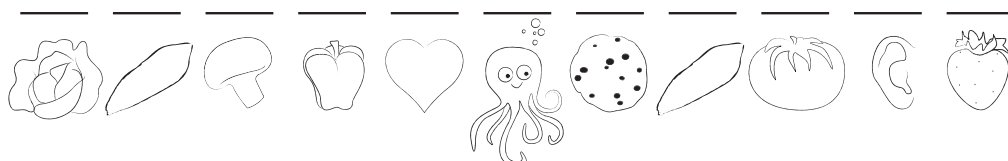
Use your DETECTIVE smarts to crack the code. Then, answer the question below.



The macrophages need more troops.

Help!

Who do the leukocytes call in?



Word Scramble

The Human Body Detectives need your help!
Be a super HBD and unscramble these words and phrases.



mahnu doyb tetivdeec



bnoe rmarwo

gmapcerhoa



luuva



rfeev



Are You an Immune Buffoon?

Not only do the Human Body Detectives love a great case, but they love a funny joke... Remember what we learned? Laughing lowers levels of stress hormones and strengthens the immune system!

Do chickens think rubber humans are funny?

H
A

What did the mother turkey tell the baby turkey when he ate too fast?

Stop gobblin' your food!

Why did the student eat his homework?

H
A

The teacher told him it was a piece of cake!

What did the left eye say to the right eye?

Between us, something smells!

Knock Knock

Who's there?

Donut

Donut who?

Donut talk with your mouth full!



What has many ears but can't hear a thing?

A cornfield!

Why is your nose in the middle of your face?

Because it is in the scenter!

H
A

Why did the boy blush when he opened the fridge?

He saw the salad dressing!

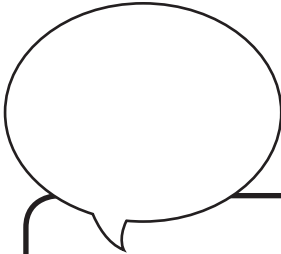
What do you call a germ who wants to have a good time?

A FunGi! (a fun guy)

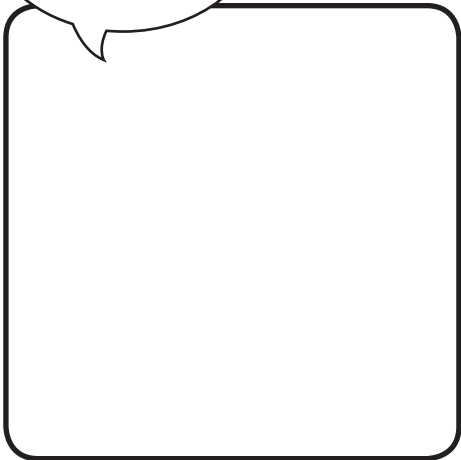
Why did the germ cross the microscope?

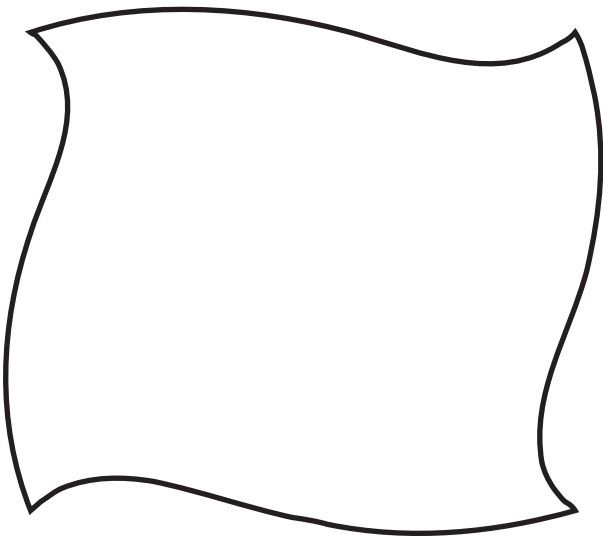
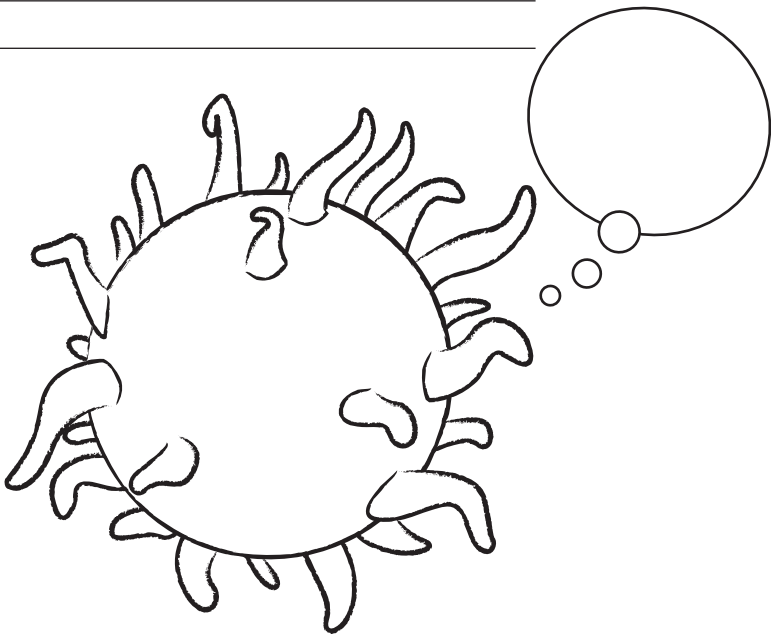
To get to the other slide!

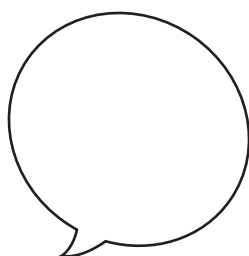
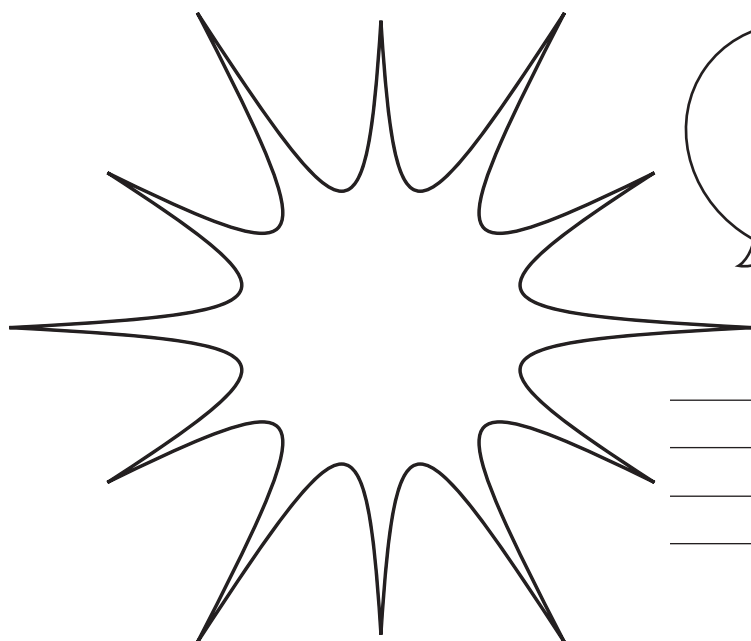
Immune Cartoon

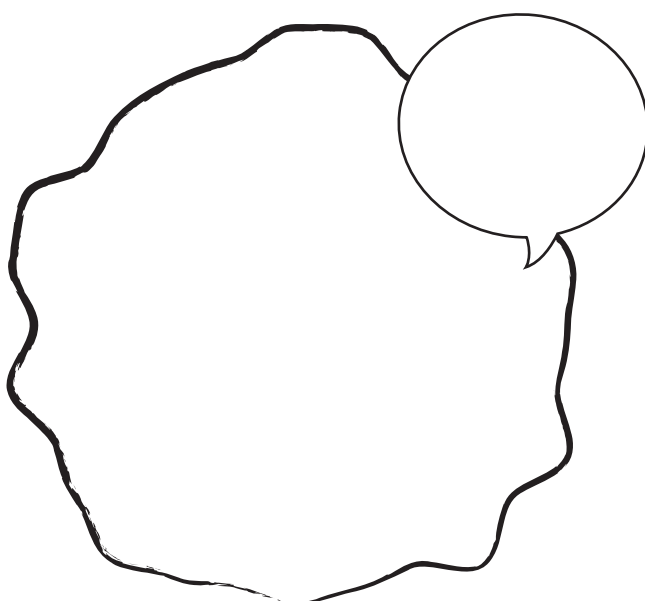
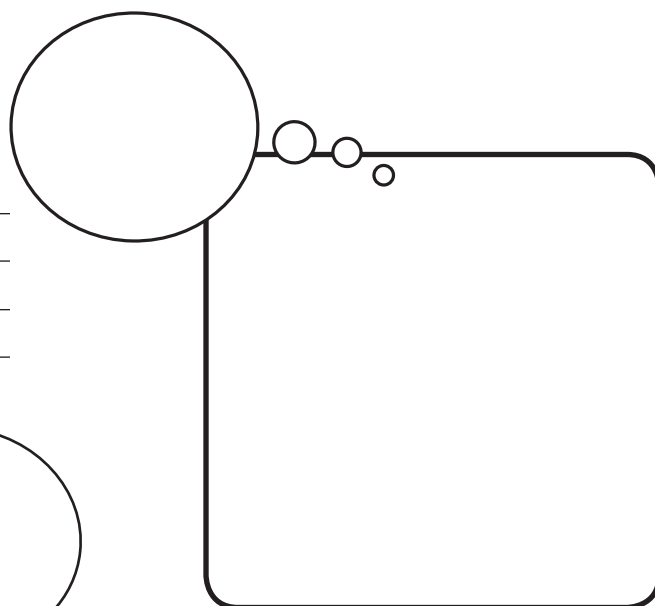


OH NO! A bug has entered your body!
Create your own immune system battle story.



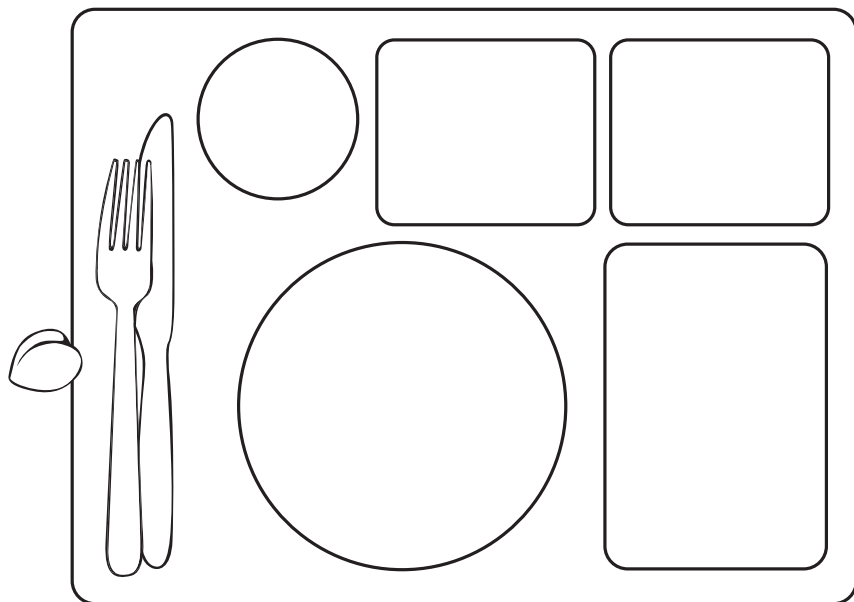






List your FAVORITE foods!

If you prepare your own food, or go to a restaurant, which foods would you choose? Are you an omnivore or vegetarian?



Meat:

Fish:

Vegetable (pick your favorite from each color group):

Green:

Yellow/orange:

Blue/purple:

Red:

Fruit (pick your favorite from each color group):

Green:

Yellow/orange:

Blue/purple:

Red:

Bean:

Dessert:

Nut:

Snack:

Beverage:

Be in Tune, Stay Immune!

Based on what you have learned, create a PERFECT, colorful meal that will help keep your immune system strong.

Appetizer (a little snack before your meal):



Main dish (a protein like chicken, fish or beans):

Vegetables (red or orange, or maybe the whole rainbow?):



Grain (how about some brown rice?):



Dessert (fresh fruit?):

Drink (remember, the healthiest drink is water!):

Human Body Detectives Picture Puzzle Fun!

The Human Body Detectives love picture puzzles.
Can you figure out what these pictures mean?



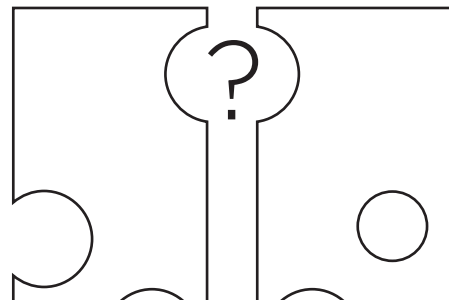
BAN  ANA



na  na

meal

ICE 



Human Body Detective Riddles

Word Bank:

eustachian tube
mucus
leukocytes
the lymphatic system



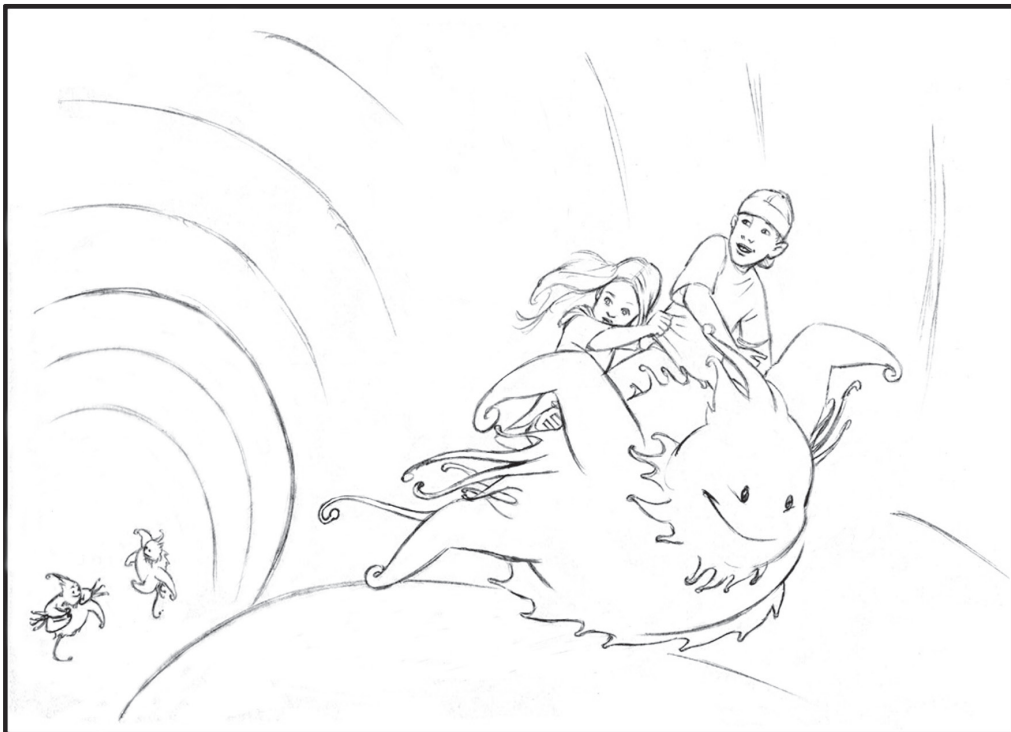
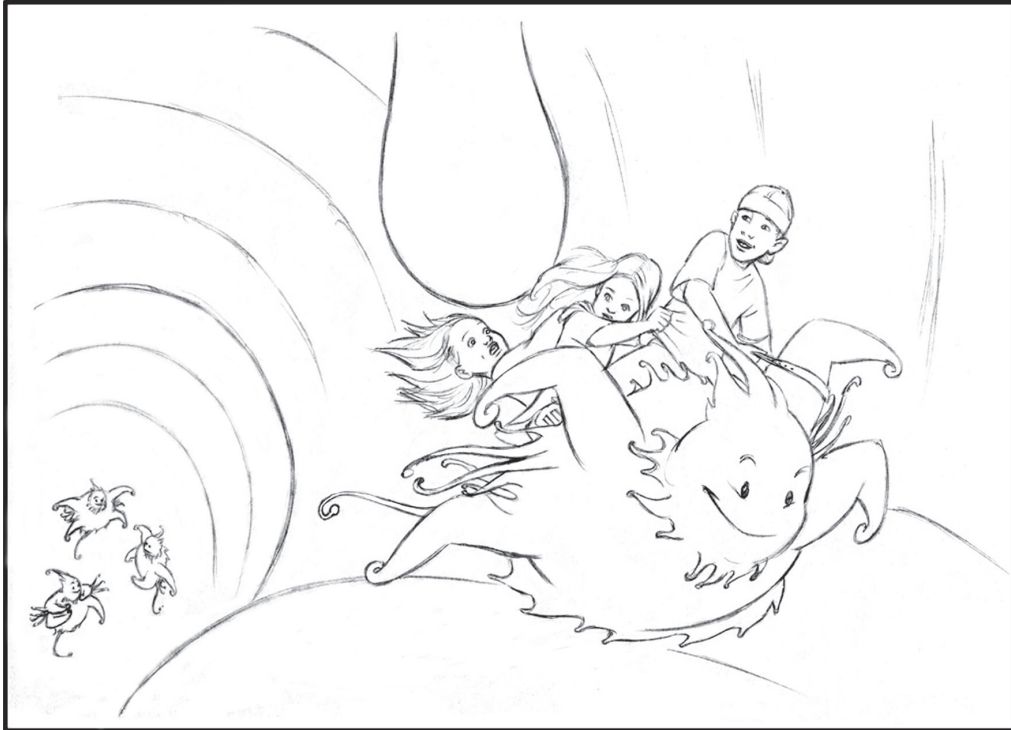
bacteria or virus
lymphocyte
macrophage
fever



- ⑥ I am green, yellow, or clear colored goopy stuff. I trap bug invaders and push them out of the body. **What am I?**
- ⑥ I am the commander-in-chief of all the white blood cells. I help direct my platoon to help destroy the bug invaders. **What am I?**
- ⑥ I am a white blood cell and the powerhouse of them all. I hunt bug invaders down, suck them in and destroy them. **What am I?**
- ⑥ When a bacteria or virus enters the body, I make the body get really hot to kill it off. **What am I?**
- ⑥ If you eat too much candy I will be very happy as sugar makes me stronger. But if I am stronger, I can make you sick. **What am I?**
- ⑥ I am made in the bone marrow and shaped like a ball with many arms. **What am I?**
- ⑥ I am a tough and fierce attacker called in by the leukocytes to fight invaders. **What am I?**
- ⑥ I commonly go by the name "ear". **What am I?**
(my fancy scientific name, that is)
- ⑥ I help white blood cells travel to many different places in the body. **What am I?**

Spot the Differences

Can you spot the 6 differences between these two pictures?





Glossary

Bacteria (bac-TEER-ee-uh) Tiny organisms that can cause illnesses in the body.

Basophil (BAY-soh-fil) A type of white blood cell that is present when the body is inflamed (like when you sprain an ankle).

Bone Marrow (BOHN MAHR-oh) The tissue found inside your bones that is responsible for making blood cells, including white blood cells.

Cilia (SIL-ee-uh) Short, thin hairs located inside the nose and ears. They capture and try to push out things the body does not want.

Eosinophil (ee-oh-SIN-oh-fil) A type of white blood cell that fights infections from allergies and parasites.

Eustachian Tube (yoo-STAY-shan TOOB) The fancy, scientific word for the inside of your ear.

Fever (FEE-ver) An important immune response, a rise in body temperature that helps kill off unwanted bugs or bacteria.

Immune System (ih-MYOON SIS-tem) The system in the body responsible for identifying and fighting off unwanted bacteria, viruses, or other bugs. White blood cells play an important role in the immune system.

Leukocyte (LUKE-oh-site) Another name for white blood cell and a very important part of the immune system; a cell that helps protect the body against sickness. There are several different types of leukocytes, such as basophils, eosinophils, lymphocytes, macrophages, and neutrophils, all of which have different, specific jobs.

Lymphocyte (LIMF-oh-site) A type of white blood cell that is very important in helping your body be healthy. The lymphocyte has many jobs but one of them is to help the neutrophils fight viruses.

Lymphatic System (limf-AT-ik SIS-tem) The lymphatic system has two important jobs. First, it makes sure the fluids in the body are balanced, and second, it aids the immune system in defending against invading bacteria and viruses.

Macrophage (MAK-roh-fahj) A type of white blood cell that moves quickly to grab, suck in and kill any unwanted invasive material in the body.

Mucus (MYOO-kuss) A sticky, gooey substance found in the nose and other parts of the body, that traps bacteria and pushes it out of the body.

Neutrophil (NEW-troh-fil) A type of white blood cell that fights off viral infections, often one of the first at the scene of an infection.

Spleen (SPLEEN) The spleen is an organ located on the left side of your abdominal area, by your stomach. It is about the size of your fist and has many jobs, one of which is to help out the immune system by producing some of the white blood cells.

Thymus (THYE-muss) The thymus is an organ found just below your neck that produces some of your white blood cells.

Virus (VYE-russ) In Latin (an ancient language), "virus" means "poison." Like bacteria, viruses can cause illness in the body.



Human Body Detective Theme Song

Ooooooh! Human Body Detectives!
Ooooooh! Let the journey begin!

Ooooooh! Human Body Detectives!
Ooooooh! Let the journey begin!

Our body's working 24-7.
Looks like it needs our help.
Leukocytes to the rescue
and us going in pursuit.

Ooooooh! Human Body Detectives!
Ooooooh! Let the journey begin!

Ooooooh! Human Body Detectives!
Ooooooh! Let the journey begin!

Sticky, goopy mucus, too.
Yellow, green, and smelly. Eww.
Riding on a soft, red donut,
We must be floating on blood! WOW!

Ooooooh! Human Body Detectives!
Ooooooh! Let the journey begin!

Ooooooh! Human Body Detectives!
Ooooooh! Let the journey begin!

Watch out for those grape-like things.
Where could we be now?
Look at those bubbles, hope they don't pop!
That's just flatulence.





Ooooooh! Human Body Detectives!
Ooooooh! Let the journey begin!



Ooooooh! Human Body Detectives!
Ooooooh! Let the journey begin!



Duck! That was the uvula.
We must be in the mouth,
Directing food down the tube.
Where will we go now?



Ooooooh! Human Body Detectives!
Ooooooh! Let the journey begin!

Ooooooh! Human Body Detectives!
Ooooooh! Let the journey begin!

And introducing our detective names:
Pearl's our girl! And Merrin is so carin'.
Come along and learn something!
'Cuz we're educational, inspirational, motivational, too.
WHOO!



Ooooooh! Human Body Detectives!
Ooooooh! Let the journey begin!

Ooooooh! Human Body Detectives!
Ooooooh! Let the journey begin!



YAH!

Answers

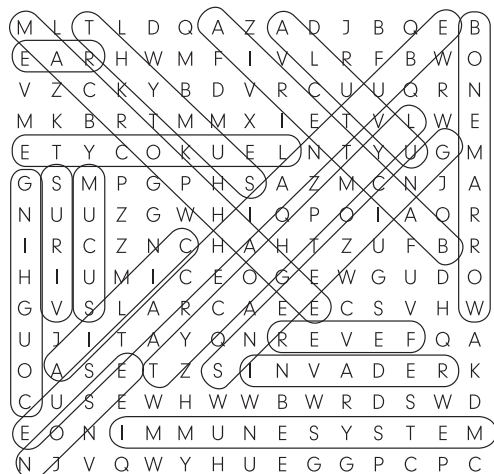
Immune Mystery Story

Miss Beautifully Bad

HBD Riddles

1. Mucus
2. Leukocytes
3. Lymphocyte
4. A fever
5. Bacteria or virus
6. Macrophage
7. Eustachian tube
8. Lymphatic system

Immune Search



Picture Puzzle Fun!

1. Banana split
2. Who cut the cheese?
3. French toast
4. Well-balanced meal
5. Tuna fish
6. Ice cube
7. Cool as a cucumber

Merrin, Pearl and Sam Wonder

Eustachian Tube

Goopy green mucus goo

Quickster

White blood cells

Bacteria

Commonyms

1. They are all white blood cells.
2. They are breakfast foods.
3. They are different systems in the body.
4. They are all in the mouth.
5. They are located in the nose.
6. They are all germs, the bad guys.
7. They are all green veggies.
8. They are Human Body Detectives!

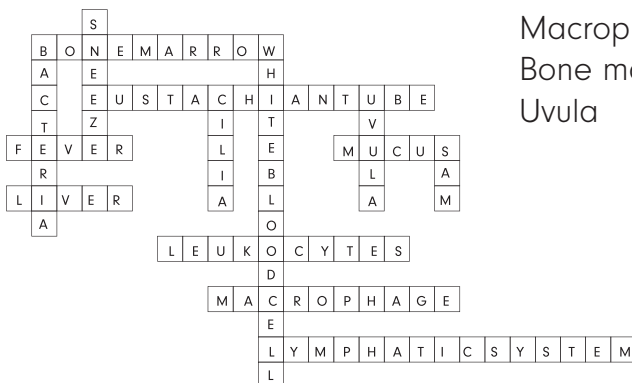
Spot the Differences

1. Uvula
2. Quickster's arm
3. Quickster's eyebrows
4. Macrophage missing
5. Belt missing
6. Merrin is missing

HBD Code

Lymphocytes to the rescue

Immune Crossword



Word Scrambles

Human Body Detectives
Fever
Macrophage
Bone marrow
Uvula