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Why are people more likely to get sick when it is cold?

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Abstract

LOWER READING LEVEL

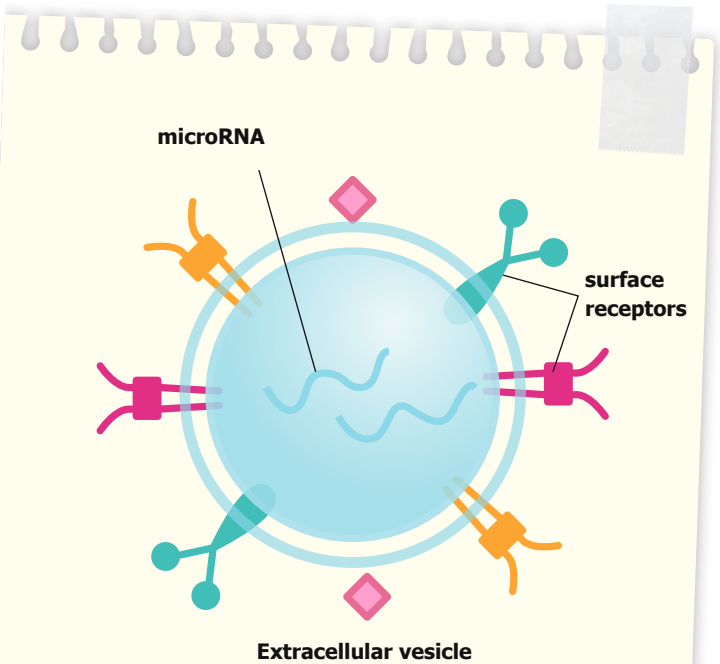
Did you know that your nose protects you from germs? The nose makes small sacs (like tiny pouches of liquid) called extracellular vesicles. Our research looked into how the nose uses these sacs to fight viruses. We also wanted to know if cold weather affects how well the nose fights viruses. We found that cells in the nose make extracellular vesicles when they detect a virus. We learned that the extracellular vesicles contain particles that can kill viruses. But there are fewer extracellular vesicles when it's colder. They also do not contain as many particles that can kill the virus. That means that we are more likely to get sick when it is chilly outside!

Introduction

Germs can enter the body through the nose. But the nose fights back! In an earlier study, we learned that cells in the front of the nose detect bacteria. They then release billions of tiny sacs called **extracellular vesicles**. The extracellular vesicles contain fluid and special substances to fight the bacteria. They then surround and attack the bacteria before it can infect the cells.

In this study, we wanted to figure out if the nose also fights viruses. A virus causes an infection by entering cells. Once inside, it uses parts of the cell to make many copies of itself. When there are too many copies, it can damage or kill the cells.

We **hypothesized** that **nasal cells** release extracellular vesicles when there is a virus. We thought that they carry a special particle, called **microRNA**. MicroRNA can destroy the virus. We know that the extracellular vesicles have special spots on the outside. We call these spots **surface receptors**. These spots attach to the virus particles. That stops them from entering cells. We also hypothesized that this response to viruses does not work as well when the weather is cold.



An extracellular vesicle with surface receptors and microRNA.

Methods

Viral Response

We took nasal **tissue** samples from healthy volunteers. We used this tissue to grow nasal cells in the laboratory. We exposed the samples to three different common **respiratory viruses**. These included the cold virus. We also used a particle that acts like a virus. Then we analyzed how the cells responded to each virus. We looked at the number of extracellular vesicles they produced. We also looked at their surface receptors and the particles they carried.

Effects of Temperature

We placed the volunteers in a room that was about 4.4°C (39.9°F). Then we measured the temperature inside of their noses. Next, we took nasal tissue samples and lowered their temperature. We matched the temperature to the temperature of the volunteers' noses when it was cold. We exposed the colder nasal cells to the three respiratory viruses. Then we analyzed how the nasal cells responded to each virus.

Results

Viral Response

We found that nasal cells detected the viruses. This caused them to produce extracellular vesicles. We found that the extracellular vesicles carried microRNA. We also noticed that they had surface receptors. There were fewer virus particles in the nasal cells.

Effects of Temperature

When we lowered the room temperature from 23°C to 4.4°C, the volunteers' nose temperature went down, too. The nose temperature decreased by about 5°C.

There were fewer extracellular vesicles when the nasal cells were colder (Fig.1). These extracellular vesicles did not contain as much microRNA. They also did not have as many surface receptors.

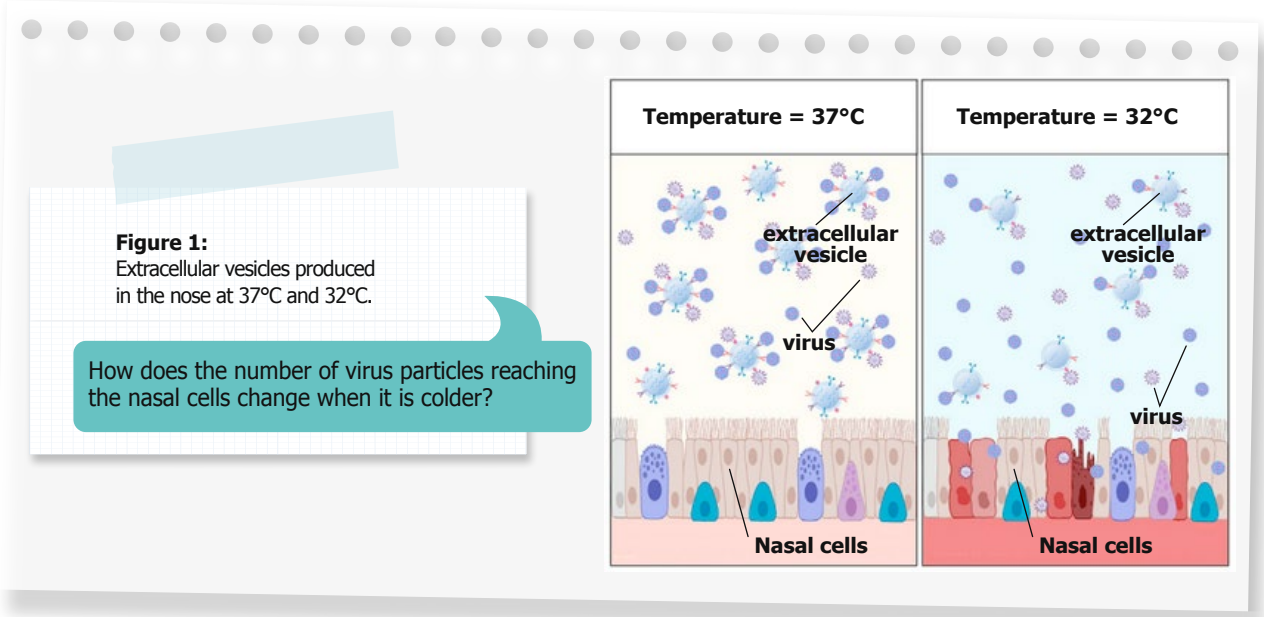


Figure 1:
Extracellular vesicles produced in the nose at 37°C and 32°C.

How does the number of virus particles reaching the nasal cells change when it is colder?

Discussion

Nasal cells fight viruses using extracellular vesicles. They distract the virus and stop it from reaching the cells. That's because the virus attaches to the extracellular vesicles. Then the microRNA inside kills the virus. That means the virus particles don't reach the cells. They are unable to start an infection. Colder weather makes it harder for the nose to

fight viruses. This is because the temperature inside the nose goes down. When it is colder, there are fewer extracellular vesicles. What they look like also changes. They have fewer surface receptors. They also have fewer microRNA particles. This means that more virus particles reach the nasal cells. So, we now have a reason why people are more likely to catch colds in colder weather.

Conclusion

Our study shows that the nose helps stop viral infections. It also proves that people are more likely to get sick when it is colder. That means you need to be extra careful during the colder parts of the year. How?

- Wash your hands with soap and water.
- Clean common surfaces, such as in the kitchen or bathroom.
- Consider wearing a mask when you are sick or if you will come into contact with someone else who is sick.
- Stay home when you aren't feeling well.

Also, practice good health habits. For example, eat healthy food and exercise. Healthy habits keep your body at its best to fight viruses!

Glossary of Key Terms

Extracellular vesicles – tiny fluid-filled sacs released by nasal cells. They contain particles to destroy bacteria and viruses.

Hypothesize – to give an explanation for something that fits the information we have so far but isn't proven yet.

microRNA – a special particle that stops a virus from taking over a cell. The microRNA destroys the virus.

Nasal cells – cells in the nose.

Respiratory virus – a virus that affects the respiratory system. The respiratory system includes the organs that help you breathe, such as the nose and lungs.

Surface receptors – locations on the outside of a cell or extracellular vesicle to which a virus can attach. When a virus attaches itself to these locations, the cell lets the virus inside.

Tissue – a group of cells that work together to perform a specific job.

REFERENCES

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Check your understanding

1. What are the two parts of an extracellular vesicle that help it fight viruses?

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2. Why did we measure the temperature inside the volunteers' noses?

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3. How do colder temperatures affect the nose's response to viruses?

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4. Select one of the healthy habits listed in the article and identify a way to help people use these habits in your school.

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5. Individually or in a small group, brainstorm a list of additional good health habits that will help prevent viral infections, such as common colds and the flu.

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