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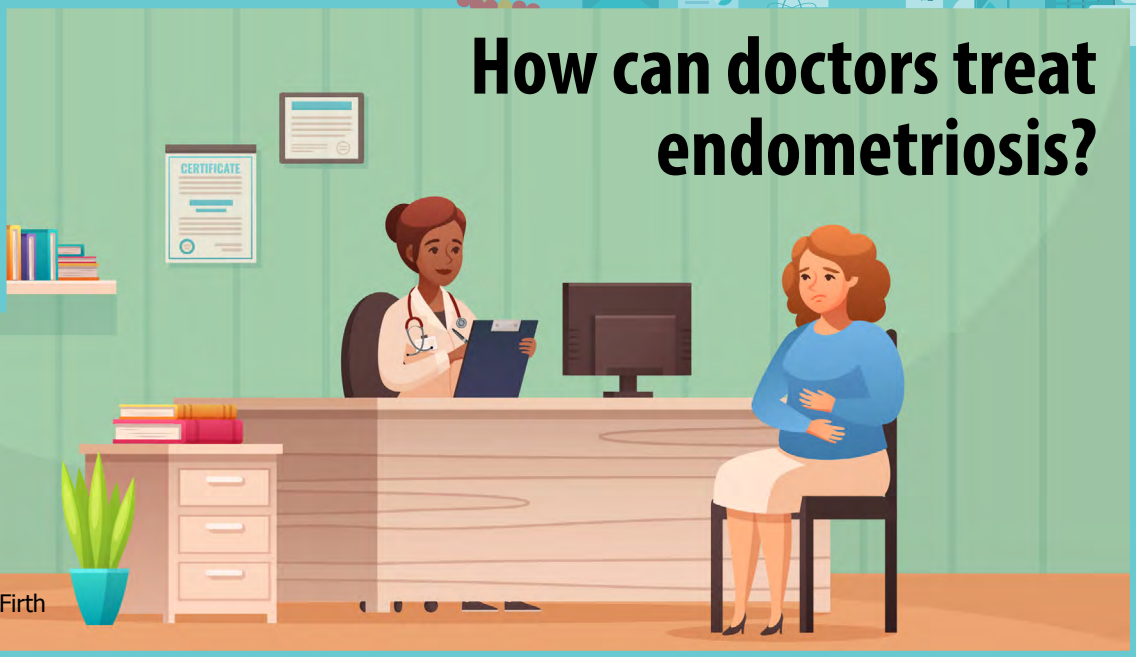
How can doctors treat endometriosis?



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Abstract

Normally, the tissue that makes up each of your body's organs only grows in the place it should. But that's not the case for people with endometriosis. With this disease, tissue that lines the uterus grows outside the uterus as lesions. These cause pain and infertility. Endometriosis affects about 10% of women worldwide as well as some trans people. On very rare occasions it has been detected in men.

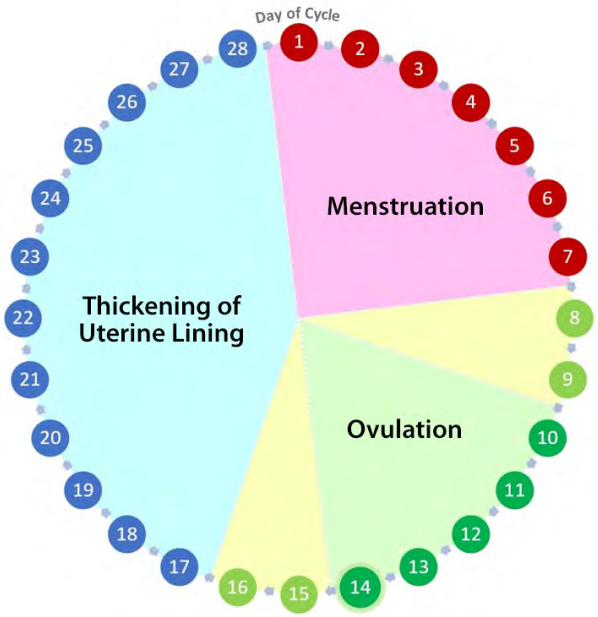
Scientists know that people with endometriosis have high levels of a type of white blood cell called macrophages. We wanted to find out how macrophages affected the growth of lesions as well as pain in people with endometriosis. So, we studied mice with endometriosis in a laboratory. We changed the number and type of macrophages present in the mice to learn how these cells affect the development of lesions. We discovered that certain types of macrophages may help to treat endometriosis. Others encourage the development of lesions. Our findings could lead to new treatments for endometriosis patients!

Introduction

The **endometrium** is a **mucous membrane** that lines the inside of the uterus. Every month, the endometrium thickens. Then the upper layer is shed and leaves the body with blood through the vagina. This is called menstruation. In **endometriosis**, the endometrium also grows in the **abdominal cavity**, outside of the uterus. This is called **ectopic endometrium** or endometriosis **lesions**. Some scientists believe that this is caused by the endometrium traveling back through the fallopian tubes.

The ectopic endometrium in the abdominal cavity cannot leave the body. It can continue to grow with each menstrual cycle and cause pain. The pain experienced by people with endometriosis can be as extreme as a heart attack or a burst appendix.

Not all women menstruate and not all people who menstruate are women. Women and adolescent girls who haven't started their period yet, take certain medications, had their uterus removed, or are post-menopausal do not menstruate. Transgender or non-binary people may menstruate.



A typical 28-day menstrual cycle. Image: © Conception Advice.

Scientists have seen that **macrophages** (a type of white blood cell) seem to be very closely linked to endometriosis. We wanted to learn more about how macrophages affect the growth of ectopic endometrium. We wondered if macrophages from different parts of the body might have a different effect on endometriosis.

Methods

We studied a group of female mice with endometriosis. There are three kinds of macrophages in the ectopic endometrium of mice.

1. Endometrial macrophages. These follow the ectopic endometrium from the uterus into the abdominal cavity.
2. Native abdominal macrophages. These live in the abdominal cavity of healthy mice and mice with endometriosis.
3. Recruited abdominal macrophages. These move from other parts of the body through the bloodstream into the ectopic endometrium in response to inflammation.

We used various techniques to "turn off" specific types of macrophages. These included genetically modifying the mice or giving them different medications. We looked at mice with different combinations of macrophages. We wanted to see which combinations affected the growth of the ectopic endometrium.

We performed a series of 3 experiments with groups of mice. Each group had a different macrophage combination in their ectopic endometrium.

Results

→ **Experiment 1**: We "turned off" both the native AND recruited abdominal macrophages. We observed that much more ectopic endometrium began to grow in the mice.

→ **Experiment 2**: We "turned off" the endometrial macrophages. The ectopic endometrium was much smaller than in the other groups of mice.

→ **Experiment 3**: "Turning up" the number of recruited abdominal macrophages led to a lot less growth of ectopic endometrium. For several mice in this group, no ectopic endometrium grew at all!

We show these results in Table 1.

Which experiments resulted in an improvement in the endometriosis?

	Experiment 1	Experiment 2	Experiment 3
Endometrial macrophages	On	Off	On
Native abdominal macrophages	Off	On	On
Recruited abdominal macrophages	Off	On	Extra
Ectopic endometrium growth	↑ ☹	↓ ☺	↓ ☺

Table 1: The macrophage combinations we used in the mice for each experiment. For each combination, we observed if the ectopic endometrium grew faster or slower.

Discussion

We removed recruited abdominal macrophages from the mice and their endometriosis got worse. So, recruited abdominal macrophages protect the mice. They slow the growth of ectopic endometrium. If the mice have extra recruited abdominal macrophages, their condition improves!

When we removed the endometrial macrophages, the ectopic endometrium was much smaller. So, endometrial macrophages can cause the ectopic endometrium to grow.

Conclusion

Today, surgery is one of the only options for many endometriosis patients. This research presents a new idea – focusing on the patient's macrophages. We are finding new treatments that can change how macrophages work. They act more like recruited abdominal macrophages.

Endometriosis is often undiagnosed. Many doctors tell women that their severe menstrual pain is normal. This leads to misunderstood patients with untreated illness. If you have pain with menstruation that stops you going about your normal life, you should tell your doctor. Some pain is normal but it should not stop you from going to school or socializing. Some pain might be a symptom of endometriosis. Fortunately, awareness of endometriosis in the scientific community is growing. And new treatments are being developed at an exciting rate!

Glossary of Key Terms

Abdominal cavity - the region of the body that contains internal organs like the stomach and the liver.

Endometriosis - a disease in which the lining of the uterus also grows inside the abdominal cavity, where the internal organs are.

Endometrium - the lining of the uterus. Ectopic endometrium refers to uterine lining that is growing outside of the uterus and in the abdominal cavity.

Lesion - an area of the body that has been damaged by a disease or injury.

Menstrual cycle - a series of natural changes that occur in response to hormones. The changes in the structure of the uterus make pregnancy possible.

Macrophage - a type of white blood cell that helps defend the body from infections, but can also cause painful inflammation.

Mucous membrane - a layer of cells lining a part of the body that produce mucous to provide protection and/or lubrication. Mucous membranes line many parts of the body, including the nose, mouth, eyelids, lungs, and stomach.

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Check your understanding

1. Where does endometrium normally grow? Where does endometrium grow in people with endometriosis?

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2. Why is ectopic endometrium unable to leave the body like the regular endometrium does?

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3. How does slowing the growth of ectopic endometrium prevent the pain felt by endometriosis patients?

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4. How do the different types of macrophages from the same mouse behave differently?

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5. Why do you think endometriosis is so often undiagnosed? What could be done to improve this?

REFERENCES

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