



Cell biology

with Associate Professor
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Talking points

Knowledge & Comprehension

1. What is *Toxoplasma gondii*, and which organisms can it infect?
2. What does the term 'cell cycle' mean?
3. What are the two main forms of the parasite that help it spread and survive in the environment and hosts?
4. How does the cell cycle contribute to *Toxoplasma gondii*'s survival and ability to infect hosts?
5. In what ways does *Toxoplasma gondii*'s cell cycle differ from the cell cycles of other organisms?

Application

6. How do scientists use genetically modified strains to study the cell cycle of *Toxoplasma gondii*?
7. What is fluorescence microscopy, and how does it help researchers observe the parasite's cell cycle?

Analysis

8. Why might the unique cell cycle regulators of *Toxoplasma gondii* be useful targets for developing new drugs?
9. How do the risks of toxoplasmosis differ between healthy individuals and those who are pregnant or have weakened immune systems?

Evaluation

10. How effective are current treatments for toxoplasmosis, and why is it important to develop improved anti-parasitic drugs?
11. To what extent do you think studying the cell cycle of *Toxoplasma gondii* could lead to breakthroughs in treating other parasitic infections? What challenges might researchers face when applying these findings to other parasites?

Activity

Toxoplasma gondii is a parasite with a unique and complex cell cycle that helps it survive and spread in many hosts. Understanding the parasite's biology can help researchers develop drugs that specifically target it without harming humans.

- Using what you know from Elena's article and other resources, such as scientific websites or textbooks, review the biology of *Toxoplasma gondii*, focusing on its cell cycle, life stages and how it infects hosts.
- Identify at least three specific features or processes of the parasite that you think would be good targets for a drug. These could include unique proteins, cell cycle checkpoints, the centrosome structure or its encysted form.
- For each feature you select, explain why it would be an effective target for a drug and how interfering with it might stop the parasite from reproducing or surviving.
- Consider the potential benefits and challenges of targeting each feature. For example, could your drug avoid harming the human host? Would it work against the dormant cysts?
- Write a short paragraph or have a discussion with your classmates summarising the main points and why your approach is promising.

Reflection questions:

- How did understanding the unique aspects of *Toxoplasma gondii*'s cell cycle influence your choice of drug targets?
- Which of the features you selected do you think would be easiest or hardest to develop a drug against, and why?
- What challenges do you think researchers face when designing drugs that target parasites without affecting humans?
- How could your drug design help improve current treatments for toxoplasmosis?
- If you could collaborate with other scientists, what additional expertise would you want to help develop your drug?

More resources

- To learn more about how *Toxoplasma gondii* spreads and how toxoplasmosis develops, watch this informative animation from The Moredun Group: [youtube.com/watch?v=_MvNf8hXR2Q](https://www.youtube.com/watch?v=_MvNf8hXR2Q)
- Find out more about the research taking place in the University of South Florida's Department of Internal Medicine where Elena works: health.usf.edu/medicine/internalmedicine