

Cellular and molecular biology

with Dr Martin Engelke and the Cellular Organization Lab

Talking points

Knowledge & Comprehension

1. What are the similarities and differences in the forms and functions of motile and non-motile cilia?
2. What role does kinesin-2 play in building and maintaining cilia?
3. Why does Martin introduce mutated kinesin-2 genes into cultured cells?
4. How will Farimah track the movement of motor proteins?
5. What did Lindsey discover when she inhibited kinesin-2?

Application

6. If Farimah can determine how kinesin-2 reaches the base of cilia, how could this knowledge be applied to drive further research in the Cellular Organization Lab?
7. If Lindsey can determine why cilia disassemble, how could this knowledge be applied to improve human health?

Analysis

8. Why is it important to understand the drivers behind cilia growth and maintenance?
9. How have Lindsey and Farimah's personal experiences influenced their education and career pathways?

Activity

Cellular and molecular biology deals with tiny molecules that are involved in complex and complicated processes, and it can be hard to understand what these molecules are and how these processes work. It is often easier to understand these concepts if they can be visualised.

Draw a cartoon strip to summarise the role of kinesin-2 in building and maintaining cilia. Your cartoon should introduce what cilia are, how kinesin-2 drives intraflagellar transport (IFT), and what happens if kinesin-2 is inhibited or mutated.

- How will you portray these concepts in cartoon form? For example, can you show how cilia got their name, demonstrate how kinesin-2 moves IFT 'trains', and illustrate what happens if kinesin-2 is prevented from reaching cilia?
- How will you communicate the complex mechanisms behind IFT with clear and simple languages and images?

More resources

- This article explains more about proteins: www.theconversation.com/what-is-a-protein-a-biologist-explains-152870
- Learn more about cilia: www.byjus.com/biology/cilia
- This animation shows how kinesin motor proteins 'walk' along microtubules, such as those found in cilia: www.youtube.com/watch?v=y-uuk4Pr2i8
- This video introduces IFT in a model organism, the single-celled algae *Chlamydomonas*: www.youtube.com/watch?v=L1LmRoICD_I
- This video demonstrates the structure and function of non-motile cilia: www.youtube.com/watch?v=NFAO65d7M3A
- This animation demonstrates the structure and function of motile cilia: www.youtube.com/watch?v=wEtRevG3c6I