

# Molecular genetics

with Professor Julie Cooper

## Talking points

### Knowledge

1. What are telomeres?
2. What is telomerase?

### Comprehension

3. What is the 'end replication problem', and why is it a problem?
4. What else might happen to a chromosome if it does not have telomeres at its ends, and why?

### Application

5. How do you think that introducing mutations into yeast cells helps Julie's team make discoveries about telomeres?
6. What questions would you ask to understand more about the lab techniques the team used to uncover their discoveries about cells' 'survival mode'?

### Analysis

7. Why do you think that cancers are more common in older people?
8. How do you think the lab's research might ultimately help in the development of new cancer treatments?
9. If telomerase prevents telomeres degrading and averts senescence, why do you think it is not active in all our bodies' cells?

### Evaluation

10. Many people are interested in how the science of telomeres and related molecules could slow down the ageing process. Imagine there was a breakthrough in this understanding and a powerful anti-ageing technology becomes commercially available. What do you think would be the societal and ethical implications?

## Activity

Molecular genetics lends itself to being visualised through graphics and diagrams. Design a poster or presentation that explores the functions of telomeres using graphics and diagrams, to include:

- Chromosome structure and DNA replication
- The end replication problem
- The role of telomeres
- Cancer and ageing
- How to study telomeres in the lab
- How telomere research can help society

Take some time to research further resources to make sure you have a good understanding of the science. Now design your poster or presentation, using the following as guidance:

- Aim for an audience of a similar age and knowledge level to your class.
- Which information is best conveyed through text, and which is best through visual means?
- Think about how graphics and diagrams can be clear, consistent, engaging and informative.
- What techniques can you use to make your audience interested in telomeres and eager to learn more?
- What pieces of information do you want to be most prominent and impactful in your poster?
- How can you ensure that the overall look and design of your poster is eye-catching and well-organised?

Pair up with a classmate, and take some time to talk through both posters. What similarities and differences do you notice in which information you chose to convey and how you conveyed it? Which parts of your classmate's poster do you like the best? What would you do differently if you were to do the exercise again?

## More resources

- Find out more about Julia's lab and her latest research: [medschool.cuanschutz.edu/biochemistry/people/primary-faculty/cooper-julia](https://medschool.cuanschutz.edu/biochemistry/people/primary-faculty/cooper-julia)
- This article from Khan Academy explains more about telomeres and telomerase: [www.khanacademy.org/science/biology/dna-as-the-genetic-material/dna-replication/a/telomeres-telomerase](https://www.khanacademy.org/science/biology/dna-as-the-genetic-material/dna-replication/a/telomeres-telomerase)
- This video from AsapSCIENCE explores the biology behind ageing: [www.youtube.com/watch?v=BkcXbx5rSzw](https://www.youtube.com/watch?v=BkcXbx5rSzw)