



# MOLECULAR GENETICS

WITH DR NORA ENGEL

## Talking points

### KNOWLEDGE

1. What proportion of lupus patients are female?
2. At what stages of a mouse's development do molecular differences between males and females appear?
3. What is gene expression?

### COMPREHENSION

4. Why does Nora's research rely on the use of mice?
5. How does DNA methylation influence gene expression?
6. Why is it important to study the molecular structure of genes?

### APPLICATION

7. How do you think medical doctors treating patients with conditions such as cancer, lupus and cardiovascular disease will benefit from Nora's research?

### ANALYSIS

8. How has the field of genetics benefitted from recent advances in technology? How do you think the field will progress as research methods continue to develop?
9. What scientific challenges do you think Nora must overcome when translating the results of her genetic studies from mice to humans?

### EVALUATION

10. "The best scientists are not necessarily the ones who make the best discoveries but are the ones who ask the best questions." To what extent do you agree with this idea of what makes a 'good' scientist?

## Activity

### Epigenetics: Nature versus Nurture

Nora is investigating epigenetic marks – processes that alter an individual's gene expression but do not change their genes. Many epigenetic marks are caused by environmental factors. For example, when you feel different emotions, these produce different biological chemicals in your body, and these chemicals can influence your gene expression. This explains why identical twins, who have identical genetic information, can have different health outcomes.

Read this infographic from Harvard University about the influence of epigenetics on child development: [developingchild.harvard.edu/resources/what-is-epigenetics-and-how-does-it-relate-to-child-development](https://developingchild.harvard.edu/resources/what-is-epigenetics-and-how-does-it-relate-to-child-development)

Using information from this infographic and Nora's article, design your own infographic to explain the concepts of genetics and epigenetics to the public.

Your infographic should be eye-catching, engaging and easy to understand, and should explain how:

- genes are translated into physical characteristics
- your genetic information determines your characteristics
- environmental factors determine your characteristics
- the influence of nature vs nurture on a person's development.

## More resources

• Learn more about the research being conducted in Nora's lab: [www.engellab.net](http://www.engellab.net)

• The Cornell Institute for Biology Teachers has lesson plans and activities about genetics topics: [blogs.cornell.edu/cibt/labs/genetics](https://blogs.cornell.edu/cibt/labs/genetics)