Paediatric allergy and immunology

with Professor Kirsi Järvinen-Seppo and Dr Erin Davis

Talking *points*

Knowledge

1. What is a food allergy, and what types of symptoms can it cause?
2. What is the gut microbiome?
3. What are perinatal antibiotics, and when are they given?

Comprehension

4. How does the gut microbiome help support the immune system?
5. How can breast milk influence the development of a baby's gut microbiome and immune system?

Analysis

6. What differences in allergy rates were observed between infants raised in rural farming communities and those raised in urban environments? What factors might explain these differences?
7. Why might differences in gut bacteria levels increase or decrease the risk of developing food allergies?
8. How could identifying biomarkers help doctors monitor whether a child is developing tolerance or sensitisation to certain foods?

Evaluation

9. Scientists studying infant health often collect biological samples such as blood or stool. What ethical considerations should researchers consider when working with infants and young children?
10. Research into food allergies combines microbiology, immunology, nutrition and medicine. Why is collaboration between different scientific fields important when studying complex health conditions?

Activity

To study the infant gut microbiome, the Järvinen-Seppo research programme collects stool samples from infants' diapers. In the laboratory, DNA is extracted from these samples and analysed using advanced techniques such as shotgun metagenomic sequencing. This method allows scientists to sequence all of the DNA in a sample and identify the different types of bacteria present. Bioinformatics tools are then used to analyse the data, helping researchers determine which bacteria are present, how abundant they are and what functions they might perform. Statistical analysis can then be used to compare microbiomes between infants who do and do not develop allergic diseases.

- Choose one laboratory technique used in microbiome research, such as DNA extraction, shotgun metagenomic sequencing, bioinformatics analysis, statistical analysis of microbiome data or microbial culture techniques.

- Research how your chosen technique works. Explain what type of data or information the technique produces, investigate how this technique helps scientists study bacteria in the gut, and identify any advantages or limitations of the technique

- Communicate your research findings in a format that helps you share what you have learnt with others. This could be a poster, video, labelled diagram, short presentation or any other format that helps you best communicate your findings. Share your research with others in your class and compare the different techniques that everyone researched.

- Reflect on the following questions:
  - Why is it important for scientists to use multiple techniques when studying the gut microbiome?
  - How did researching your chosen technique help you better understand how microbiome research is carried out?
  - How could improvements in laboratory techniques help scientists prevent food allergies in the future?

More *resources*

- Learn more about the Järvinen-Seppo lab's research by exploring their website: **urmc.rochester.edu/pediatrics/jarvinen-seppo-lab**

- Watch these TED talks to learn more about food allergy prevention: **youtube.com/watch?v=Gv17TWhDjgw** and **youtube.com/watch?v=ozp620yTDaE**