Renal immunology

with Dr Juan de Dios Ruiz-Rosado

Talking *points*

Knowledge

1. What is a UTI, and which parts of the urinary system can it affect?
2. What percentage of UTIs are caused by *uropathogenic Escherichia* coli (UPEC)?
3. What is acute pyelonephritis?

Comprehension

4. What are fimbriae and flagella, and how do they help UPEC infect the urinary tract?
5. Why can acute pyelonephritis lead to permanent kidney scarring, even after antibiotics are used?
6. How do neutrophils destroy bacteria once they have engulfed them?
7. How do macrophages both protect the body and potentially contribute to kidney damage?

Analysis

8. Compare the roles of neutrophils and macrophages during a kidney infection. How do their functions overlap, and how are they different?
9. Why might enhancing NADPH oxidase activity be more beneficial than simply increasing the antimicrobial capacity of neutrophils?
10. If antibiotics remove bacteria but do not control inflammation, what additional type of therapy might help prevent kidney scarring?

Evaluation

11. Juan's research uses mouse models that have been reviewed and approved by institutional committees to ensure compliance with established standards for ethical animal use. Despite this, what ethical considerations remain when using animal models in biomedical research, and how can scientists balance the potential medical benefits of such studies with concerns about animal welfare?
12. Juan's work combines immunology, microbiology, kidney biology and clinical medicine. Why is interdisciplinary collaboration important in developing new treatments for complex problems like antibiotic resistance, and what challenges might arise when experts from different fields work together?

Activity

While antibiotics can successfully treat many UTIs, their overuse and misuse have allowed some bacteria to evolve resistance, making infections increasingly difficult to treat. Juan's work aims to strengthen the body's natural immune defences so that, in the future, we may not need to rely so heavily on antibiotics. Public awareness is essential in slowing the rise of antibiotic resistance, which is why awareness campaigns play such an important role in protecting these life-saving medicines.

Design and present your own antibiotic resistance awareness campaign. Decide who your campaign is aimed at, such as primary school students, teenagers, parents or patients in a GP surgery. Think carefully about what this group is likely to already know about antibiotics, what misconceptions they may have and what tone will be most effective in influencing their behaviour (e.g., younger audiences may need simple explanations and strong visuals, while adults may respond better to statistics and real-world examples).

Do your research:

- Research what antibiotic resistance is and how antibiotic resistant infections are affecting healthcare, including why some UTIs are becoming harder to treat.
- Consider why antibiotics do not solve every part of an infection, particularly the inflammation that can lead to kidney damage.
- Find facts or statistics that will make your campaign accurate and scientifically informed.

Design your campaign:

- Choose a format that will best reach your chosen audience, such as a poster, leaflet, social media campaign, short video, presentation or infographic.
- Include a simple but scientifically accurate explanation of antibiotic resistance and why it is a serious and growing problem.
- Suggest at least three practical actions people can take.

Reflection questions:

- Why is changing people's behaviour just as important as developing new medicines when tackling antibiotic resistance?
- How can awareness campaigns influence the health choices people make in their everyday lives?
- What challenges did you face when trying to explain antibiotic resistance in a clear and simple way?

More *resources*

- Learn more about the work being done in Juan's lab at Nationwide Children's Hospital: nationwidechildrens.org research/areas-of-research/kidney-and-urinary-tract-center research-labs/ruiz-rosado-lab
- Watch these videos to learn more about antibiotic resistance: youtube.com/watch?v=ZvhFeGEDFC8 and youtube.com watch?v=xZbcwi7SfZE