

Pharmaceutical sciences

with Professor Tom Anchordoquy, Professor Dmitri Simberg, Dr Scott Tilden and Dr Madison Ricco

Talking points

Knowledge

1. What are some of the common side effects of chemotherapy?
2. What is nanomedicine?
3. What is the purpose of nanomedicine in cancer treatment?

Comprehension

4. What is the function of lipid nanoparticles in drug delivery?
5. What are the challenges that researchers face in using nanomedicine to target only cancer cells?
6. Why does the immune system react to nanoparticles as it would to an invader?
7. What is the purpose of PEGylation in enhancing nanoparticle-based drug delivery?

Application

8. How might the use of type III interferon (IFN- λ) change the experience of patients undergoing chemotherapy?

9. Imagine you are a researcher. How would you design a basic experiment to test whether IFN- λ can prevent drug accumulation in healthy cells?

10. Madison highlights the importance of exploring the diverse range of career possibilities in science and pharmacy. How could you put this advice into action?

Analysis

11. What are the limitations of PEGylation in drug delivery, and why might some patients experience adverse reactions?
12. What would be the implications of successfully overcoming the barriers to nucleic acid-based drug administration for cancer treatment? How could this advancement influence the future of pharmaceutical science and patient care?

Evaluation

13. Reflecting on Scott's commitment to learning through mistakes and Dmitri's drive to understand complex interactions

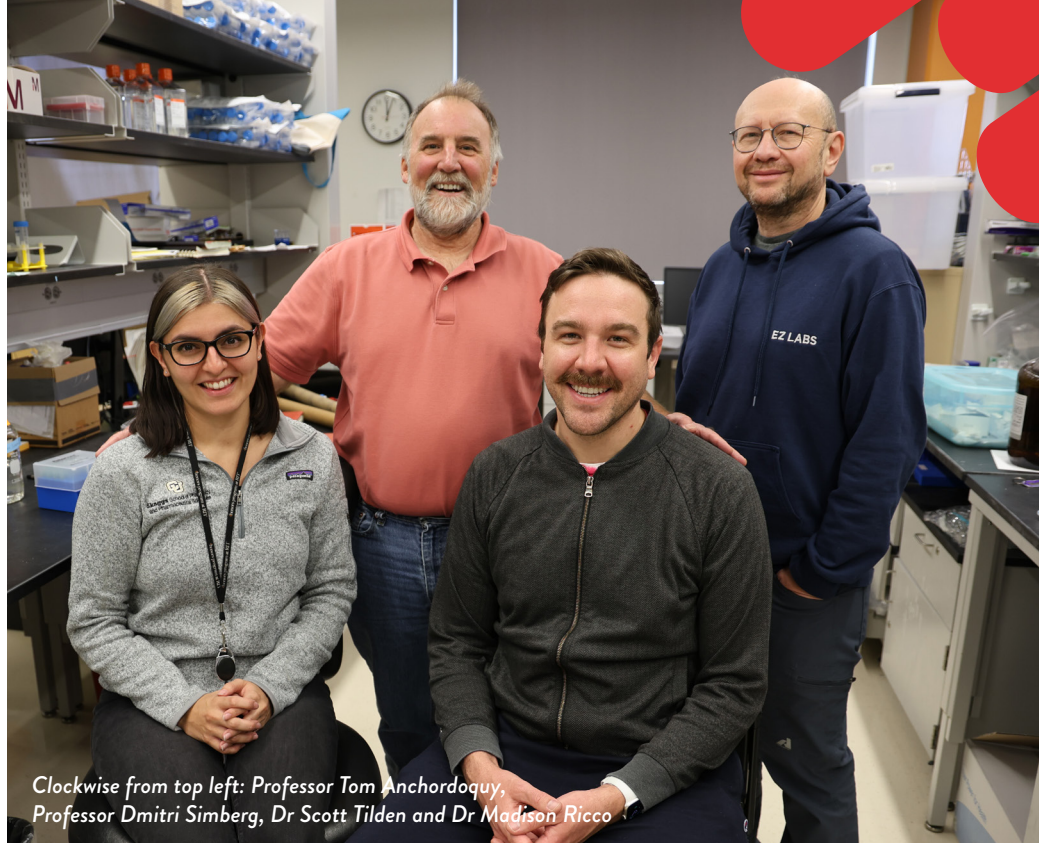
within the immune system, what qualities do you think are essential for scientific innovation and resilience? How can these qualities impact both the success of a project and the personal growth of a researcher?

14. Considering Tom's reflections on his initial imposter syndrome and eventual fulfilment in pharmaceutical sciences, to what extent do you think interdisciplinary collaboration strengthens scientific research? How might diverse academic backgrounds contribute both challenges and unique advantages to research?
15. Given the team's approach to using nucleic acid-based drugs for cancer treatment, which relies on targeting mechanisms not previously considered, how might exploring unconventional or 'counter-intuitive' methods impact the future of pharmaceutical research? What potential risks and rewards could arise from pursuing approaches that challenge established scientific assumptions?

Activity

Research in cancer treatment is continually evolving. Innovations like nanomedicine and targeted immune responses, such as the use of type III interferon (IFN- λ), show promise for reducing chemotherapy's damaging effects on healthy cells. With ongoing discoveries, new approaches are being developed to improve patient outcomes and quality of life during treatment.

- Using this article and online resources, make notes on how IFN- λ is being used to potentially reduce chemotherapy's harmful effects on healthy cells.
- Select another innovation in cancer treatment to research (such as immunotherapy, CRISPR gene editing, or targeted drug delivery). Use online sources to find out how this innovation works, its benefits, and any challenges it faces.
- Compare and contrast the two approaches: how does each treatment



Clockwise from top left: Professor Tom Anchordoquy, Professor Dmitri Simberg, Dr Scott Tilden and Dr Madison Ricco

aim to minimise side effects and improve effectiveness? Think about the methods they use to target cancer cells and reduce damage to healthy cells.

- Create a brief presentation summarising the two treatments, explaining how each approach could impact patient experiences and treatment outcomes.

Reflection questions

- How do you think these innovations could change the way patients view cancer treatment?
- In your opinion, which approach holds the most promise for making chemotherapy safer, and why?

More resources

CU Denver/SSPPS Pharmacy Pathway Program (shorturl.at/tnl5Q): Madison explains, "This 3 and 4-year programme offers students a robust foundation in healthcare experiences and tailored support to prepare for a career in pharmacy."

One-on-One Advising (shorturl.at/cmdcW): "Students from all backgrounds are invited to meet with our advising team for personalised guidance on exploring pharmacy as a career. These one-on-one sessions allow students to discuss their career goals, learn about pharmacy pathways, and receive tailored support on their journey," says Madison.

The School of Pharmacy at CU Anschutz Medical Campus offers several outreach initiatives designed to educate and empower students from diverse backgrounds:

Colorado Undergraduate Research in Environmental Health Sciences (shorturl.at/viTxF): This paid year-long research and mentorship opportunity is specifically aimed at sophomore or junior-level undergraduate science majors from underrepresented minority populations and/or students with disabilities or disadvantaged backgrounds.

Pharmacy Outreach Program (shorturl.at/SWq2q): This programme introduces first-generation and marginalised high school students to opportunities in healthcare, science and pharmacy.

The broader CU Anschutz Medical Campus supports various outreach efforts, including:
CU Pre-Health Scholars Program (shorturl.at/plxLN): Providing STEAM (science, technology, engineering, arts and mathematics) events for students in grades 6 to 12.

Undergraduate Pre-Health Program (shorturl.at/oCeeC): This programme is committed to increasing the number of individuals within healthcare professions who have overcome challenges in their lives, preparing participants for their chosen professional school and healthcare fields.

High School Scholars Program (shorturl.at/6Go4c): This initiative is designed to inspire and support high school students interested in pursuing careers in healthcare and science.