

32. Leveraging Cancer Metabolism

1 unit, Kayvan Keshari, April 6, 2026

This builds on the Cancer Metabolism unit where students should be familiar with the fundamentals of pathways which control proliferation, are driven by oncogenes and respond to nutrient status. The lecture and paper discussion will focus on the ability to use this biochemistry to manipulate cancer metabolism, develop diagnostics and therapeutic strategies.

1. Re-Introduction to Isotope tracing and Flux analysis
2. Drugging metabolism
 - a. Glucose metabolism
 - b. Glutamine metabolism
 - c. Fatty acid metabolism
 - d. Nucleotide metabolism
3. Detecting metabolism
 - a. Methods - Optical, electrochemical, PET and MRI
 - b. What is the difference between uptake, the pool and the flux?
4. Engineering metabolism
 - a. Can we manipulate the metabolism of a cell to do what we want?
 - b. What can we learn from model organisms?

Discussion Paper¹

Reading²⁻⁴

- 1 Wang, M. *et al.* A wearable electrochemical biosensor for the monitoring of metabolites and nutrients. *Nat Biomed Eng* **6**, 1225-1235, doi:10.1038/s41551-022-00916-z (2022).
- 2 Nielsen, J. & Keasling, J. D. Engineering Cellular Metabolism. *Cell* **164**, 1185-1197, doi:10.1016/j.cell.2016.02.004 (2016).
- 3 Stine, Z. E., Schug, Z. T., Salvino, J. M. & Dang, C. V. Targeting cancer metabolism in the era of precision oncology. *Nat Rev Drug Discov* **21**, 141-162, doi:10.1038/s41573-021-00339-6 (2022).
- 4 DeBerardinis, R. J. & Keshari, K. R. Metabolic analysis as a driver for discovery, diagnosis, and therapy. *Cell* **185**, 2678-2689, doi:10.1016/j.cell.2022.06.029 (2022).