

## 14. Immune Cell Metabolism.

1 unit, Santosh Vardhana, February 19, 2026

### Lecture outline:

- I. Review of T-cell activation and proliferation, including the role of co-stimulation
- II. Overview of cellular metabolism and its role in regulating cellular homeostasis and proliferation
- III. How is cellular metabolism connected to T-cell activation and proliferation?
- IV. How does cellular metabolism affect the function of other immune cells (B-cells, macrophages)
- V. Implications for T-cell functions during anti-tumor immunity

### Discussion Paper:

Immunity. 2002 Jun;16(6):769-77. doi: 10.1016/s1074-7613(02)00323-0.

#### **The CD28 signaling pathway regulates glucose metabolism**

[Kenneth A Frauwirth](#)<sup>1</sup>, [James L Riley](#), [Marian H Harris](#), [Richard V Parry](#), [Jeffrey C Rathmell](#), [David R Plas](#), [Rebecca L Elstrom](#), [Carl H June](#), [Craig B Thompson](#)

### Reviews and Background Papers:

Science . 2009 May 22;324(5930):1029-33. doi: 10.1126/science.1160809.

#### **Understanding the Warburg effect: the metabolic requirements of cell proliferation**

[Matthew G Vander Heiden](#)<sup>1</sup>, [Lewis C Cantley](#), [Craig B Thompson](#)

Immunity. 2016 May 17;44(5):973-88. doi: 10.1016/j.immuni.2016.04.020.

#### **CD28 Costimulation: From Mechanism to Therapy**

[Jonathan H Esensten](#)<sup>1</sup>, [Ynes A Helou](#)<sup>2</sup>, [Gaurav Chopra](#)<sup>3</sup>, [Arthur Weiss](#)<sup>4</sup>, [Jeffrey A Bluestone](#)<sup>5</sup>

Nat Rev Immunol. 2016 Sep;16(9):553-65. doi: 10.1038/nri.2016.70. Epub 2016 Jul 11.

#### **A guide to immunometabolism for immunologists**

[Luke A J O'Neill](#)<sup>1</sup>, [Rigel J Kishton](#)<sup>2</sup>, [Jeff Rathmell](#)<sup>2</sup>