

Energy and Metabolism

Core Energy Metabolism and Signaling

Supplemental Materials

These supplemental materials are designed to support learning and teaching of the **Energy and Metabolism: Core Energy Metabolism and Signaling lecture**. They may be used by individual learners to deepen their understanding of key concepts in geroscience and by instructors to facilitate classroom discussions, assignments, or other educational activities.

The materials include:

1. Cases and discussion questions to encourage reflection and application of lecture concepts.
2. Glossary terms to support understanding of specialized geroscience terminology.
3. References and additional resources for learners who wish to explore the topic in greater depth.

Instructors are encouraged to adapt these materials as needed to meet the learning goals of their courses.

Cases/Discussions

- 1) What is the metabolic cost of running on glycolysis? More ATP can be generated fast, but lactate and acid excretion have to be dealt with eventually.
- 2) What else are lipids used for? Membranes are essential to life and a variety of lipids are needed to create fluidity, anchor proteins, and signal.
- 3) What are the risks of calorie restriction mimetics? Does signaling low energy or nutrients when they are really high have the potential to do damage?

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Glossary

TG – triglyceride (3 fatty acids attached to a glycerol backbone)

FFA – free fatty acid (= nonesterified fatty acid, NEFA)

MAG – monoacylglycerol, glycerol with one fatty acid attached

VLDL – very low density lipoprotein, TG carrying particles released by the liver

AMP – adenosine monophosphate

ADP – adenosine diphosphate

ATP – adenosine triphosphate

CoA – coenzyme A

FATP – fatty acid transfer protein

PPi – inorganic pyrophosphate

NAD⁺ – nicotinamide adenine dinucleotide (oxidized)

NADH – nicotinamide adenine dinucleotide (reduced, carrying high energy electrons)

FAD – flavin adenine dinucleotide (oxidized)

FADH₂ – flavin adenine dinucleotide (reduced, carrying high energy electrons)

UDP-glucose – uridine diphosphate glucose, an intermediate in glycogen synthesis

TCA – tricarboxylic acid cycle (= Krebs cycle)

OAA – oxaloacetate, 4-carbon compound in the tricarboxylic acid cycle

AKG – alpha-ketoglutarate, 5-carbon compound in the tricarboxylic acid cycle

CPT1 – carnitine palmitoyl transferase 1, outer mitochondrial membrane

CPT2 – carnitine palmitoyl transferase 2, inner mitochondrial membrane

CACT – carnitine-acylcarnitine translocase, inner mitochondrial membrane

ETC – electron transport chain

mTORC1 – mechanistic (previously mammalian) target of rapamycin

AMPK – AMP activated protein kinase

References

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