Course 2851 Principles of Metabolism
Metabolism and endocrinology programme, Karolinska Institutet

Lecture 7

The tricarboxylic acid (TCA) cycle

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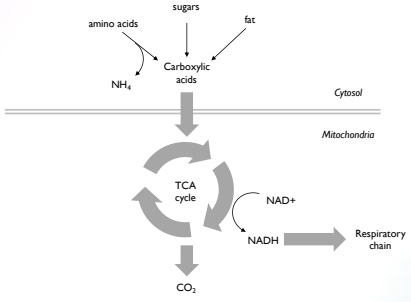
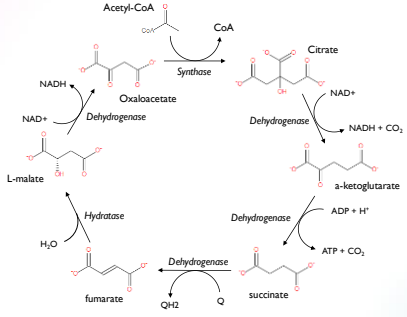
The TCA cycle: terminal oxidization to CO_2

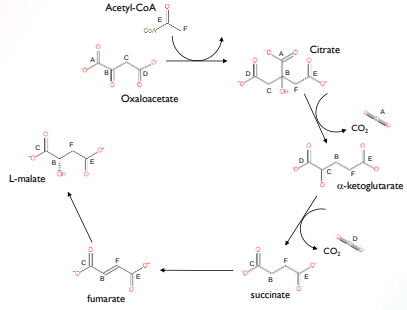
A flexible enzyme system, accepting a variety of substrates



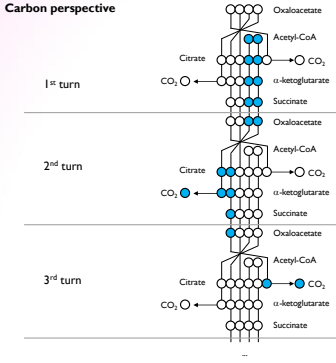
Stepwise oxidation



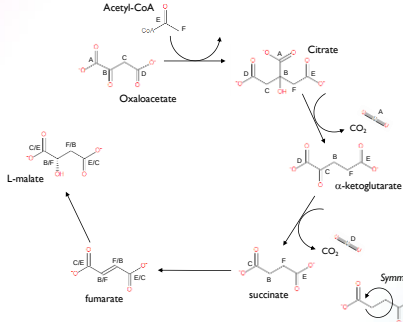
A carbon perspective



Three "turns" of the cycle

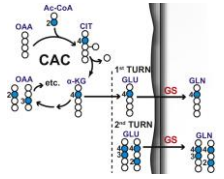


Molecular symmetry complicates things further ...



Molecular symmetry complicates things further ...

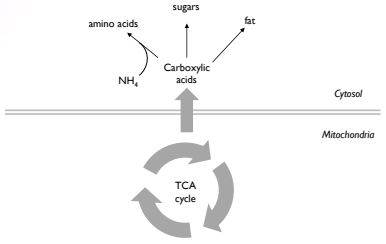
Glucose oxidation in brain tumors (NMR)



Marin-Valencia et al, Cell Metabolism 15:827-37,2012.

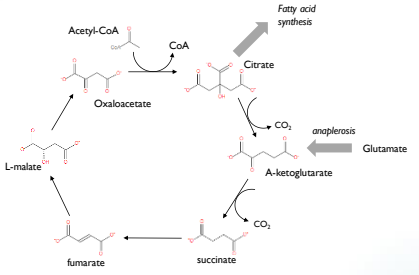
The TCA cycle in biosynthesis

As a source of precursor metabolites



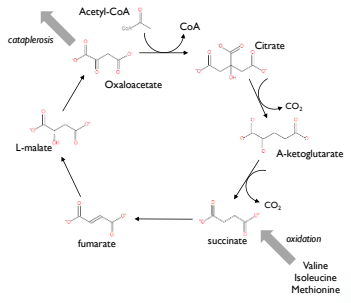
Anaplerosis

Lost carbon must be "refilled"



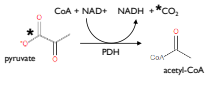
Cataplerosis

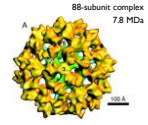
Surplus carbon must be "drained"



Accessory enzymes

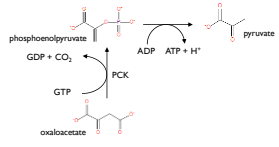
- The pyruvate dehydrogenase complex controls pyruvate entry

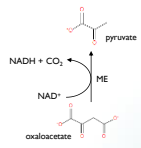




Zhou et al, PNAS 98:14802–14807, 2001

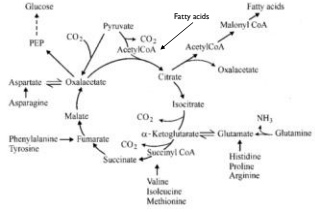
- Regeneration of pyruvate from oxaloacetate





Yang et al, JBC 284:27025-27029, 2009.

The TCA cycle as a "hub" of metabolism



Owen et al, JBC 277, 30409-30412, 2002