CONCEPT: AMINO ACID CATABOLISM: CARBON ATOMS

Glucogenic vs Ketogenic Amino Acids

- Amino acids can be categorized based on whether they can synthesize glucose or ketone bodies.
  - □ **Glucogenic Amino Acids**: only synthesize _____.
  - □ **Ketogenic Amino Acids:** only synthesize _____ bodies.

Glucogenic vs Ketogenic Amino Acids

Glucogenic			Ketogenic	Both
Alanine	Glutamate	Proline	Leucine	**Ph**enylalanine
Arginine	Glutamine	Serine	Lysine	**I**soleucine
Asparagine	Glycine	Valine		**T**hreonine
Aspartate	Histidine			**T**ryptophan
Cysteine	Methionine			**T**yrosine

MEMORY TOOL: _____

EXAMPLE: Label each amino acid as glucogenic (G), ketogenic (K), or both (B).

a) Serine _____

b) Lysine _____

c) Glutamine _____

d) Tryptophan _____

PRACTICE: Identify amino acid that is considered to be glucogenic but not ketogenic.

a) Phenylalanine

b) Leucine

c) Tyrosine

d) Aspartate

e) Lysine

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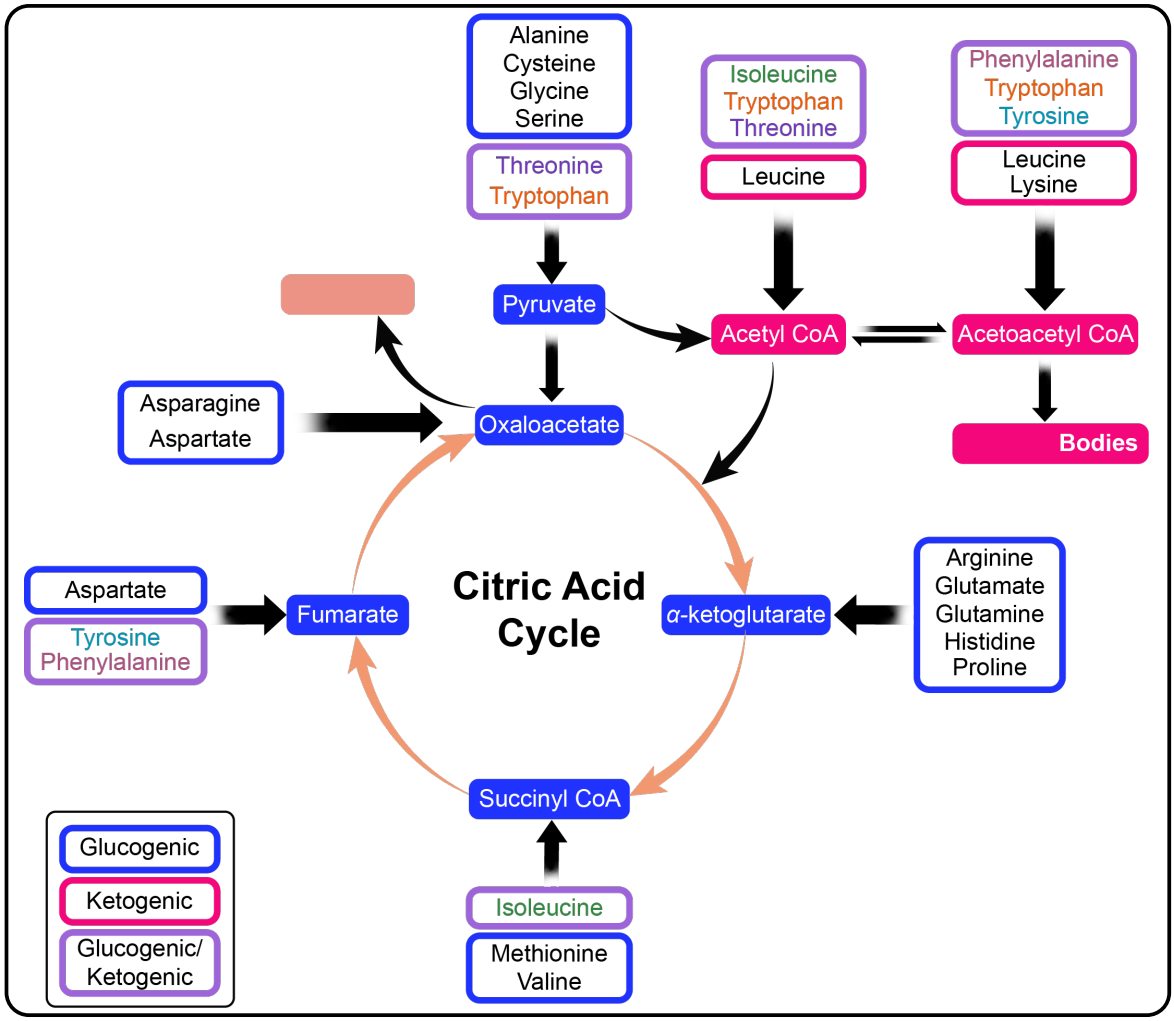
Fate of Amino Acid Carbon Atoms

- **Recall**: transamination produces an α-keto acid.
- C atoms of α-keto acid are converted to 1 or more of the 7 _____ producing intermediates.
  - □ Citric acid cycle intermediates can be used to synthesize _____ through gluconeogenesis.
  - □ Acetyl CoA and Acetoacetyl CoA can be used to synthesize _____ bodies through ketogenesis.
    - Based on the metabolic pathways, some amino acids can synthesize both.



NOTE: _____ cannot create glucose because it uses oxaloacetate at the beginning of citric acid cycle.

EXAMPLE: Select correct statement about amino acid intermediates.

a) Tyrosine is only ketogenic because it produces acetoacetyl CoA.

b) Aspartate is considered glucogenic and ketogenic because it degrades to 2 intermediates of Krebs cycle.

c) Isoleucine can be used to synthesize glucose and ketone bodies due to the 2 different intermediates it can form.

d) Pyruvate is the product of only glucogenic amino acids.

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Remembering Amino Acid Intermediates

MEMORY TOOL 1: **Pyruvate**: Glycine, Tryptophan, Cysteine, Serine, Threonine, Alanine.

____irates ____iding in ____ater**,** _____ _____ _____owing ____gae.

MEMORY TOOL 2: **Oxaloacetate:** Aspartate, Asparagine.

_____en _____ire to eat _____us.

MEMORY TOOL 3: ***α*-ketoglutarate**: Proline, Histidine, Arginine, Glutamate, Glutamine.

_____red eating _____tein to fuel _____ _____ms and both _____.

MEMORY TOOL 4: **Succinyl CoA**: Valine, Methionine, Isoleucine.

_____ulent ___anilla ____elon __ce-cream.

MEMORY TOOL 5: **Fumarate**: Tyrosine, Phenylalanine, Aspartate.

____rious _____es ___lying on _____halt.

MEMORY TOOL 6: **Acetyl CoA**: Isoleucine, Leucine, Threonine, Tryptophan.

_____ ____ __osing a _____d place _____y.

MEMORY TOOL 7: **Acetoacetyl CoA**: Tyrosine, Leucine, Lysine, Tryptophan, Phenylalanine.

_____lyn ____ing ___oose ___nots ____ith ____lowers.

EXAMPLE: Select the correct list of amino acids from which pyruvate can be metabolized.

a) Alanine, Methionine, Aspartate, Glutamine, Tyrosine, Isoleucine.

b) Isoleucine, Aspartate, Threonine, Tyrosine, Lysine.

c) Tryptophan, Alanine, Cysteine, Glycine, Serine, Threonine.

d) Phenylalanine, Tryptophan, Tyrosine, Leucine, Lysine.

PRACTICE: Which intermediate can be produced from degradation of carbon atoms in glutamate?

a) *α*-Ketoglutarate

b) Pyruvate

c) Acetyl CoA

d) Succinyl CoA