9.41 Riboflavin Functions

Riboflavin is required for the production of FAD and FMN. Below are some of the functions of FAD and FMN:

1. Citric Acid Cycle
2. Electron Transport Chain
3. Fatty Acid Oxidation
4. Niacin Synthesis
5. Vitamin B6 Activation
6. Neurotransmitter Catabolism
7. Antioxidant Enzymes

1. **Citric Acid Cycle** - FAD is reduced to FADH₂ in the citric acid cycle when succinate is converted to fumarate by succinic dehydrogenase as circled below.
2. Electron Transport Chain - Under aerobic conditions, the electron transport chain is where the FADH$_2$ is used to produce ATP. Complex I of the electron transport chain includes a FMN molecule. The electron transport chain is shown below.
3. **Fatty Acid oxidation** - During fatty acid oxidation FAD is converted to FADH₂ as shown below.

4. **Niacin synthesis** - As you will hear more about in the niacin section, niacin can be synthesized from tryptophan as shown below. An intermediate in this synthesis is kynurenine, and one of the multiple steps between kynurenine to niacin requires FAD.
5. **Vitamin B₆ Activation** - The enzyme that creates the active form of vitamin B₆ (pyridoxal phosphate) requires FMN.

6. **Neurotransmitter Catabolism** - The enzyme monoamine oxidase (MAO) requires FAD. This enzyme shown below is important in the catabolism of neurotransmitters such as dopamine and serotonin.
Figure 9.416 Catabolism of dopamine involves monoamine oxidase, an enzyme that requires FAD."
Catabolism of serotonin involves monoamine oxidase, an enzyme that requires FAD.

Antioxidant Enzymes
- The antioxidant enzymes glutathione reductase and thioredoxin reductase both require FAD as a cofactor. Thioredoxin reductase is a selenoenzyme. The function of glutathione reductase is shown in the following link. Glutathione reductase can reduce glutathione that can then be used by the selenoenzyme glutathione peroxidase to convert hydrogen peroxide to water.

Web Link
The Glutathione Oxidation Reduction (Redox) Cycle
In addition to the functions listed above, FAD is also used in folate activation, choline catabolism, and purine metabolism\(^1\).

**References & Links**


**Links**

The Glutathione Oxidation Reduction (Redox) Cycle -
http://lpi.oregonstate.edu/infocenter/minerals/selenium/gsh.html