Glycerol phosphate shuttle:

STEPS

- This shuttle system is not much common to be used in humans. It is present in insect flight muscle and in white muscle.
- This alternative means of moving reducing equivalents from the cytosol to the respiratory chain operates in skeletal muscle and the brain.
- It delivers the reducing equivalents from NADH through FAD in **glycerol 3-phosphate dehydrogenase** to ubiquinone and thus into Complex III, not Complex I
- Cytosolic glycerol 3-phosphate dehydrogenase oxidizes NADH to NAD+.
- The reducing equivalents are transported through glycerol 3-phosphate into the mitochondria.
- An isozyme of glycerol 3-phosphate dehydrogenase—present on the outer surface of the inner mitochondrial membrane— reduces FAD to $FADH_2$.
- Dihydroxyacetone phosphate escapes into the cytosol and the shuttling continues.
- $FADH_2$ gets oxidized via ETC to generate 2 ATP.
- Note that this shuttle does not involve membrane transport systems.