

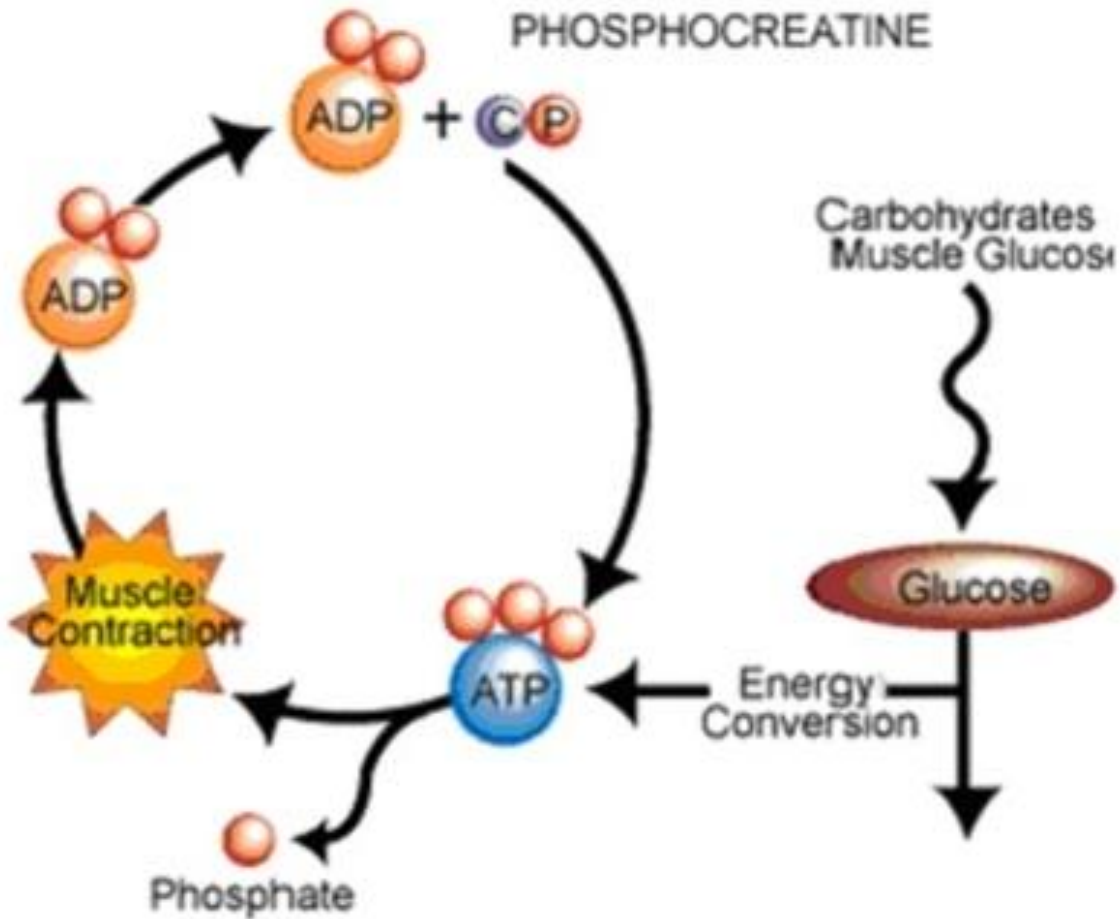
Muscle Physiology “Odds and Ends”

MMHS Anatomy and Physiology

Muscle Contraction

A. Energy Sources

1. ATP can run out and must be regenerated.
 - a. creatine phosphate is 4–6 times more abundant than ATP
 - b. creatine phosphate converts ADP back to ATP.



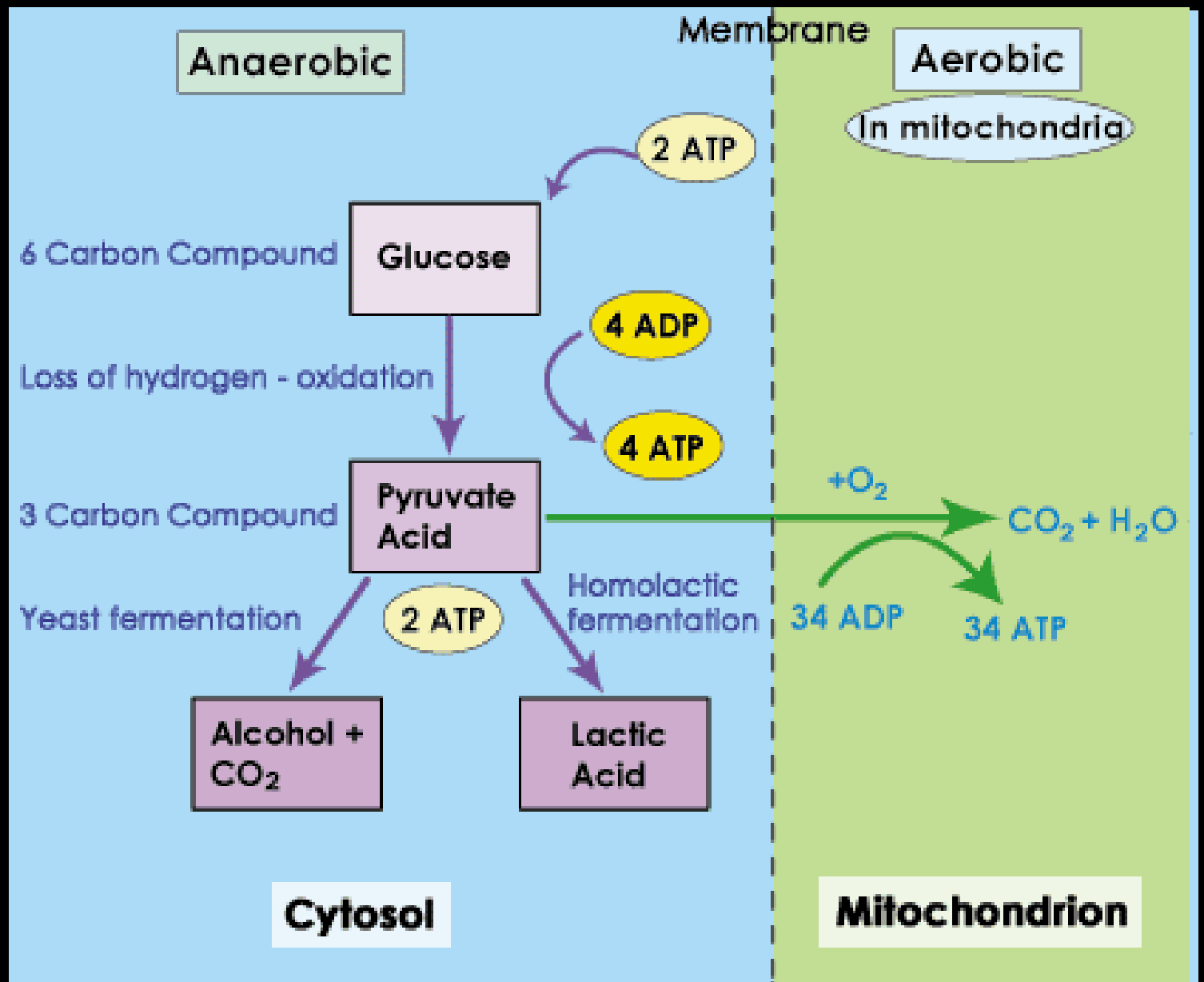
Oxygen

2. Oxygen Requirements for Muscle contract

a) Aerobic Respiration – muscles contract in the presence of oxygen; doesn't last long under strenuous activity.

b) Anaerobic Respiration – muscle contraction is absent of oxygen = very common during weight work outs.


c) Lactic Acid – is produced when the O₂ supply is low; may lead to cramping since the pH is lowered in the muscles.



Muscle Fatigue

1. Muscle loses its ability to contract.
 - a. interruption of blood supply.
 - b. lack of ACH (rare)
 - c. build up of lactic acid in the muscles.
2. Cramps
 - a. Occurs during fatigue
 - b. Uncontrolled stimulation of muscles triggered by changes in extracellular fluid surrounding the muscle fibers.

Muscular Responses

- A. All or None Response – a muscle fiber exposed to a threshold stimulus responds to its fullest extent.
 - B. Twitch – a single contraction that lasts only a fraction of a second.
 - C. Phases of Contraction
 1. Contraction – time during muscle shortening.
 2. Lag Phase – delay b/w stimulus and contraction.
 3. Tetany – sustained contraction lacking any period of relaxation.
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Muscular Responses Cont'd

D. Fatigue-Resistant Muscles - slow-twitch muscles with increased blood supply.

E. Fatigable Muscles - fast-twitch muscles; respond to strenuous exercise.

Slow Twitch vs. Fast Twitch



Sustained Contractions

1. Muscle Tone

a) repeated nerve impulses from spinal cord.

b) helps maintain posture

2. Isometric contractions

a) tension builds in muscle but no shortening occurs.

b) ex. Holding a heavy weight above the ground.

3. Isotonic contractions

a. tension rises and is sustained while muscle shortens

b. example: writing, walking, running, jumping