

UNIT-1 ACTION POTENTIAL

ACTION POTENTIAL

Action potential is defined as a series of electrical changes that occur in the membrane potential when the muscle or nerve is stimulated.

Action potential occurs in two major phases:

1. Depolarization
2. Repolarization.

. Initial Depolarization

Initial depolarization (first phase) is because of rapid opening of fast **sodium channels** and the rapid influx of sodium ions, as in the case of skeletal muscle fiber.

2. Initial Repolarization

Initial repolarization is due to the transient (short duration) opening of **potassium channels** and efflux of a small quantity of potassium ions from the muscle fiber. Simultaneously, the fast sodium channels close suddenly and slow sodium channels open, resulting in **slow influx of low quantity of sodium ions**.

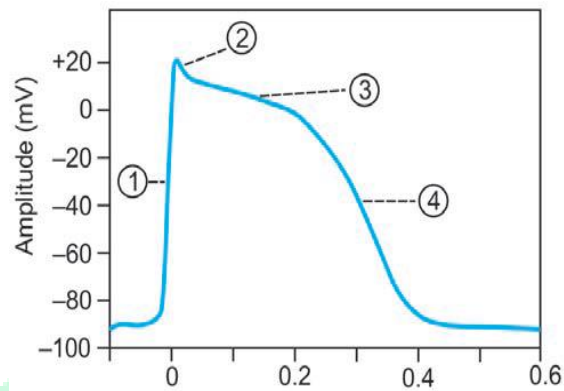
3. Plateau or Final Depolarization

Plateau is due to the slow opening of **calcium channels**. These channels are kept open for a longer period and cause influx of large number of calcium ions. Already the slow sodium channels are opened, through which slow influx of sodium ions continues. Because of the entry of calcium and sodium ions into the muscle fiber, positivity is maintained inside the muscle fiber, producing prolonged depolarization, i.e. plateau. Calcium ions entering the muscle fiber play an important role in the contractile process.

4. Final Repolarization

Final repolarization is due to **efflux of potassium ions**. Number of potassium ions moving out of the muscle fiber exceeds the number of calcium ions moving in. It makes

negativity inside, resulting in final repolarization. Potassium efflux continues until the end of repolarization.



Refractory period:

Refractory period is the period in which the muscle does not show any response to a stimulus. It is of two types:

1. Absolute refractory period
2. Relative refractory period.

Absolute Refractory Period

Absolute refractory period is the period during which the muscle does not show any response at all, whatever may be the strength of the stimulus. It is because, the depolarization occurs during this period. So, a second depolarization is not possible.

Relative Refractory Period

Relative refractory period is the period during which the muscle shows response if the strength of stimulus is increased to maximum. It is the stage at which the muscle is in repolarizing state.