

Action potential (physiology)/hints

Action potential is a digital transmission

The amplitude (difference) of the membrane potential, in relation to **action potential**, can attain only two values:

- **maximum** : approx. 100 mV
- **zero** : action potential does not occur

Even if the amplitude of the propagating action potential is not equal to the normal value for any reason, such an action potential will be transmitted at the synapse in the same way as a normal action potential.

Action potential takes values of 0 or 100mV, generally 0 or 1. AP is therefore digital. The series of action potentials on an axon is actually a series of zeros and ones. Here there is an obvious homology between action potentials in an organism and the *bit*-encoding of data in a computer.

What's the point?

Digitization means better reliability and transmission quality (that's probably why televisions are digitalized today, telephones as well, X-rays, etc.). We just need quality transmission.

Why is digital better?

Put simply: if the signal alters itself along the way and instead of 100% amplitude comes an action potential with 120% or 70% amplitude, the neuron still knows that it should have been a normal action potential, because no other (half, three-quarter or supramaximal) simply exists (unlike the **generator potential**). So anything other than 100% is still considered normal action potential. Except zeros.

All or nothing

Explaining all or nothing is more complicated than it seems.

- *Insufficient definition* : If the stimulus is subthreshold, action potential will not occur. If the stimulus is threshold and above, the action potential is recalled.

Why is it not enough? Because it does not explain what happens for different magnitudes of suprathreshold stimuli.

- **Better:**
 - If an action potential is evoked, it will always reach its maximum amplitude – no matter how strong the evoking stimulus was. And it goes without saying that if it does not recall, it has no amplitude.
 - If the stimulus is subthreshold, AP will not occur. If the stimulus is threshold and above, action potentials are fired, with full amplitude, regardless of the strength of the stimulus.

And an additional question:

- Do two suprathreshold stimuli of different strength (both) elicit the same AP?
 - **Answer:** NO!

How ?

Sources

Related Articles

- Resting membrane potential and its changes
- Action potential
- Discussion: Action potential versus postsynaptic potential

Kategorie:Physiology Practises