Faculty of Medicine 2012

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Physiology

Sheet

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الجامعة الأردنية

Price :

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Today's lecture is about:

Substances that alert the physiology of the neuromuscular junction:

1- Prevent ACH release at the NMJ : as the Botulinum toxin (Botox) that is produced by the Clostridium Botulinum bacteria that is transmitted via food poisoning .

*Medical uses of Botox :-

1) used for cosmetic reasons to appear younger.

2) prevent excessive sweating in the arm pits .

➡ we say excessive sweating because sweating is useful when it controlled :

- It keeps the skin moisture and prevent dryers
- It reduces the body temperature .

Remember:

Sweating is controlled by the **Sympathatic NS** , Except in the arm pits where it is controlled by cholinergic fibers.

▲ The best place to inject the Botox is **under the arm** where **cholinergic fibers** that control sweating are condensed.

▲ Botox injection lasts only for (6-8) weeks, then patient can re-inject again.

3) Treatment of cervical Dystonia, where there is painful tilting of the neck to one side ,so we inject the neck and calm the patient .

4) Excessive eye twitching and eye blinking in children (due to contraction of the orbiculeris ocali muscles) which called **Blepharospasm**.

5) Squint or Strabismus: Botox will not improve vision but improve appearance.

Eyes movement are controlled by many muscles as the **medial recti** that pulls the eyes medially and **lateral recti** that pulls the eyes laterally … Squint occurs if one of these muscles become weaker, so the eyes are pulled by the stronger muscles ➡ there .we give the Botox in **the stronger** muscle.

6) Upper limb spastisity in patient's with stroke who complains of spastic paralysis ➡ local injections improve pain and general appearance.

7) Headaches associated with chromic Migraine :

It is a bengin disease usually due to stress (common in medical students).

Here, Botox is given locally in the forehead muscles to relieve muscle contraction .

8) Irritable bladder : treated with botox injection in the neck of the bladder to reduce urinary frequency.

2-Competitive antagonist on Ach R :

competitive antagonist: substances bind the Ach receptors and prevent-

.Ach from binding .

American Indians used this for hunting, by soaking the arrows in

., a plant called Curari , this plant causes paralysis

Tubocurarine (muscles relaxant in surgery) especially abdominal surgery and orthopedics surgery with multiple fractures to be able to return the bones to their position (they have to relax the muscles).

3-Anti-Cholinesterase drugs :

what is cholinesterase ??

It is an enzyme present in the end plate of muscles .
when it is released it causes break down of the remnants of Ach to prevent its prolonged functions , otherwise muscles spasm will occur .

Uses of Anti-Cholinestterase :-

- It is used in chemical wars as the **Nerve gas** (Diiso propyl flurophasphate).
  when this chemical is released in the form of gas will inhibit the function of cholinesterase enzyme forever, and there is no antidote ,so anyone who is exposed to this gas will never survive .

- Used for muscle weakness in **myasthenia Gravis .**
  A disease of young women in their 20's or 30's come suffering from muscles weakness .They have drop of their eyelids (Ptosis),can't comb their hair. They have auto anti-bodies to postsynaptic Ach receptor .
  Treatment : if we prolong the action of Ach , we can get benefit from any available Ach receptor >>> that why anti-cholinesterase are used in the treatment .

Anticholinesterase end by (-stigmine) as neostigmine , pyadostigmine , …

- Anti-cholinesterase is not only used for treatment ,but also it is diagnostic .
  If a young female comes complaining of muscles weakness and improves dramatically after receiving neostigmine >>this means she is having myasthenia

Gravis .

The difference between neostigmine and nerve gas is that neostigmine causes a **reversible** blocking of cholinesterase **in 6-8 hours** , while nerve gas effect is **indefinite and irreversible.**

*also sometimes Neostigmine is used to reverse the Curari effect after surgery .

*- one of the best drugs that has been tried in the neuromuscular junction are **anti epileptics** .

Now we will talk about another topic which is Neurotransmitter :-

we have at least 150 chemical substance on our brain that the scientist think they

potentially can function as NT … and 50 of them are very well known

weak stimulus (but above the threshold)>>fire action potential >> ↓ frequency>> ↓ NT release

strong stimulus >>more frequency of A.p >>more &more NT will be release >>more effect .

there is something which is called "**square pulse** " :this type of stimulus has a voltage and timing
it stays in the viable tissue for prolonged period
the more it stays in your viable tissue , the more is able to give intense action potential with more frequency (thousands /sec) and then >>release of huge number of NT.
check the slide …

Difference between weak short and strong prolonged action potential ..

In general ,NT are divided into two categories :

1-**small fast** acting molecules as Ach, NE, dopine, serotonin.

ex. When you put your hand on a hot object ,you have to remove it rapidly(sensory-motor) .

2- **large slowly** acting NT with prolonged actions

more important

released in small amount , but thousands time more potent.

(The Modulators) change the brain functions forever (way of behavior , mood..)

= neuropeptides .

"difference between them are written in slides you have to memorize them"

Neurotransmitter in the brain actually do a lot of changes in the neuron but the most important one is the 4th one

the receptor has got a binding site and shi tani ma fhmto :P ,the binding site where the NT binds to the receptors and activites G-protien >>α-subunit will be dislodged , and loose within the neuron and will perform one of these 4 functions :

- either closely or opening a brain channel "these channels may open for days ,weeks or months"
- might activate c-AMP or cGMP
- might activate intracellular enzyme
- -activation of gene transcription >>>leads to :formation of new proteins >>this will alter the neuron forever . "the most important"!!

Hope it was helpful ☺

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