Review Article

Effect On Neurotransmitters In Alcoholic People

ABSTRACT:

With an advancement in technology it has become easier to study about different neurotransducers and their functions. We can also study the impact of alcohol on these neurotransducers that lead to the disruption in the normal functioning of the body as a result there seems to be a tendency to have adverse effects on the body due to their malfunctioning the body has several different pathways for the functioning of these neurotransducers like glutamate, GABA, serotonin and dopamine. Some of them are excitant neurotransducers and some are interdictory both have different reactions when exposed to alcohol for a long or even a short period of time. This review paper will give a brief introduction as to what alcoholism is what it curtails and all the different pathways and the way they get blocked by the presence of alcohol in the body. We humans rely on our brain for almost all the activities we carry out during a day be it vital or non-vital. The human body works like an intricate machine and the introduction of a foreign object like alcohol causes the harmony of the machinery to bend out of place and throwing everything out of balance. The article gives as to how our brain acts in the presence of alcohol not even for a long time but short as well and is helpful to find a corrective methodic treatment for alcoholism.

KEY WORDS-GABA, serotonin, glutamate, dopamine, pathways

INTRODUCTION:

When mentioning alcohol, we usually mean the alcohol found in beverages that we consume. Alcohol is the component in these beverages that makes you drunk. The alcohol in beverages is known as ethanol.

It is made by fermentation of sugars in grains, fruits and vegetables.

It is an active ingredient in drinks and hard drinks. Causing the characteristic effects of intoxication.

It is a compound which slowly makes a person habituated to it. The misuse of alcohol causes a social awkwardness, several diagnostic conditions including physical and mental burdens. Consumption of alcohol also sometimes leads to alcoholism.(1)

Alcohol as a drug:

It slows down bodily functions like speech, gait, balance.

It affects the brain, it is a drug that reduces a person's thinking ability and clouds their judgement.(2)

Most people drink for the *hallucinogenic* effect if a person consumes more than they can tolerate they then experience alcohol's depressant effect. They start to lose coordination and control.(3)

Excessive consumption causes several depressant like phenomenas and in worst case scenarios even coma and death. These reactions depend on the amount consumed and the time frame.(4)

What are neurotransducers:

Neurotransducers are actinics which neurocyte utilize to correspond among each other and with their terminal action on affected organs in the process of neural transmission. Neural messengers are produced in and released from terminal ends into the cleft between two synapses. Then they articulate to receptors in the cell membrane of the target organ. It has an excitant or interdictory or any different kind of change on the affected organ.(5)

The most important neurotransducers are ACH, norepinephrine, dopamine, Gamma-Aminobutyric Acid (GABA), glutamate, serotonin, and histamine.

Chart 1. Above mentioned neural transducers are carriers of important messages within the body.

Excitant neurotransducers	GABA Acetylcholine Histamine Dopamine Noradrenaline Adrenaline
Interdictory neurotransducers	GABA 5-Hydroxytryptamine Dopamine
Neuromodulators	DA 5-Hydroxytryptamine Acetylcholine Histamine Norepinephrine
Neurohormones	Releasing hormones Oxytocin Antidiuretic hormone (ADH)

In the synaptic cleft voltaic impulses that have traversed down the axon are changed to the actinic kind via the liberation of neurotransducers, causing a particular retaliation in the accepting nerve fibres.

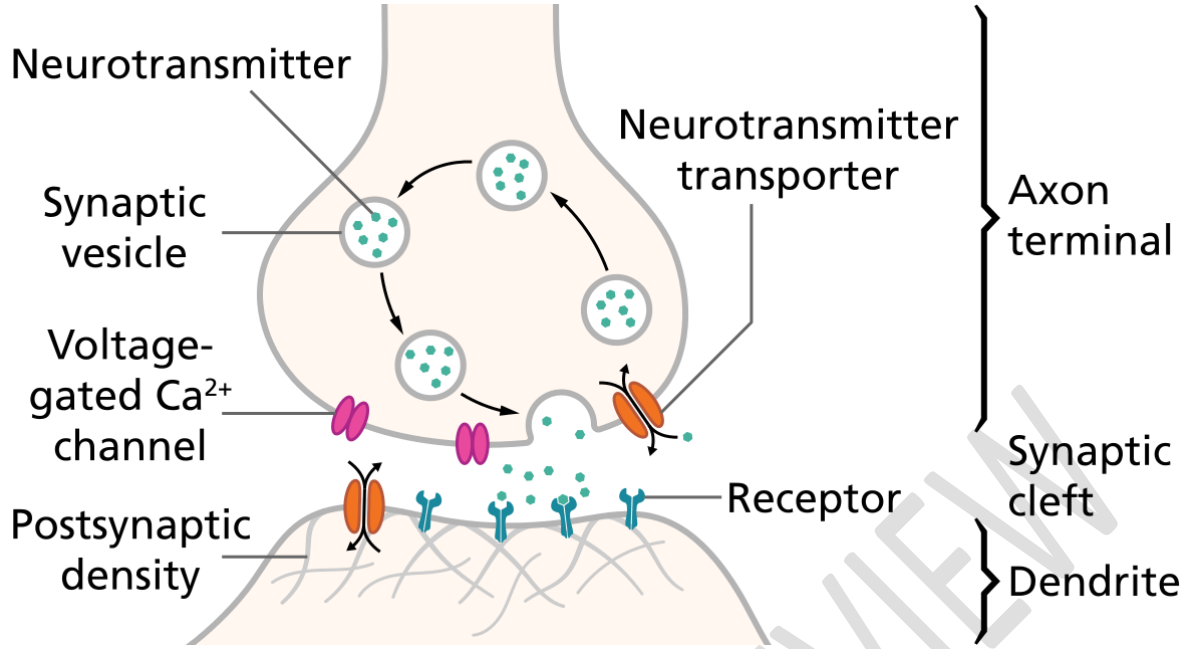
A neurotransducer affects a nerve fibre by either exciting them or forbiding them or modulating their action.

An excitant transducer involves the genesis of an voltaic impulse called an action potential in the receiving neurocyte, while an interdictory transducer prevents it. Whether a neurotransducer is excitant or interdictory depends on the receptor it binds to.(6)

Neuromodulators are not bound just to the synaptic cleft between two neurocytes, and so they can affect larger numbers at once.

These actinics and their interminglings are involved in performing several functions of the neural system as well as controlling bodily functions.

Fig 1. Neuromodulators



Neurotransducer Tests:

Neurotransducer testing is used by doctors as a tool to address the function of the neural system. They are used to measure the levels of major neurotransducers, including serotonin, dopamine, norepinephrine and GABA.

The Method Used For Neurotransducer Tests:

Neurotransducers in the plasma and its constituents are removed out by the renal system and are excreted in the urine. The presence of entire structures of neurotransducers in urine is not opposed, as evidenced by studies demonstrating renal transporters capable of filtering neurotransducers from the blood to the urine. A simple process of urine collection can be employed to obtain the levels of the main neurotransducers that regulate mood and behavior.

Neurotransducers accessible at the moment for examination:

- Epinephrine
- Norepinephrine
- Dopamine

- Serotonin
- GABA
- Glutamate
- Histamine

REINFORCEMENT AND ADDICTION:

Reinforcement is the process that leads to dependency on drugs like alcohol.(7) It provides with positive reinforcement that leads to the dependency on alcohol which provides an euphoric effect and halluginogenic pleasure that makes the person want more of it.(7) The person gets restless and has a longing for alcohol throughout the time spent without it.(8) This feeling of wanting alcohol when avoiding it is called negative reinforcement. Both the positive as well as the negative reinforcements leads to their role in alcoholism.(9)

These reinforcements are a result of their regulation by the coordination of several neurotransducers like dopamine, glutamate, GABA that reinstate the effect of alcohol by acting on the NMDA receptors.(10)

Effect of alcohol on Neurotransducers:

Alcohol is the most common form of recreational drug that all people flock to in order to have a good time be it in social gatherings or by themselves. It is not shunned upon by the society like other drugs and is therefore easily accessible and acceptable. It is made easily available to the general masses and its hallucogenic effects are very welcome by the user as it ditatches them from the outer world putting them into a euphoric dreamland providing them

with temporary emotional highs. Alcohol is consumed in the form of ethanol which has continually been synthesized from the olden times, through the of fruit juices. The fermented beverage would be stored in a container, and this rudimentary alcoholic beverage remained safe to drink throughout the winter.

It provides a euphoric effect making the person feel light headed and make them feel like they are floating.

It affects both kinds of neurotransducers:

1. Excitant, and
2. Interdictory

The effects of consumption of alcohol can be felt the instance it is consumed or can even be prolonged.

The effect of alcohol depends upon:

1. The amount of alcohol consumed
2. The frequency with which it is consumed

Depending upon the upper two statements we can determine whether a person is alcoholic or whether they drink just for recreation and very seldom.

An alcoholic person has a different response to the presence of alcohol in their body as compared to a non-alcoholic person.

Effect of alcohol on Serotonin:

Serotonin plays a major part in the uptake of alcohol leading to alcohol abuse and eventually leading the person to be dependent on alcohol. There are changes in serotonin amounts in the body as well as its by products like compounds which help diagnose carcinoid tumours. Use of pharmaceuticals leads to changing of the serotonin transmission and results in lowering of alcohol consumption. Increase in number of serotonin receptors leads to less alcohol consumption by reducing the drive to ingest alcohol thus it can be seen as something that

reduces the tendency of a person to become an alcoholic and leads to them being less anxious and other disorders related to behaviour.

Effect of alcohol on Dopamine:

Dopamine is a neurotransducer that is used for the feeling of inspiration and positive boost to the mental state. It leads to repetition of things that provides the person with motivation. Consumption of alcohol even in low amounts leads to exaggerated release of dopamine which in turn provides the person with euphoria and leads to increased consumption. Increased consumption thus is synonymous to alcohol abuse.

Effect of alcohol on GABA:

The structure of GABA and alcohol are pretty similar so consumption of excessive alcohol leads to inhibition of neural transmission this is because the alcohol articulates itself to the GABA receptors or the GABA binding sites as a result it delays neuronal transmission. Alcohol is antagonistic to the effects of neurotransmitter GABA. This neurotransducer produces a sedating and calming effect on the body and since alcohol binds to its receptors and performs the same function it also leads to feeling sluggish and euphoric. The immediate effects on the consumption of alcohol makes a person feel good but overconsumption even after getting intoxicated leads to the person becoming unconscious.

Effect of alcohol on Epinephrine :

The primary metabolic function of epinephrine is generally causing an increase in vascular pressure alcohol consumption exaggerates the effect of epinephrine this further causes increased blood pressure in the consumer causing hypertension. Other metabolic effects of alcohol includes the metabolism of fats into free fatty acids this leads to deposition of free fatty acids on the surface of the liver causing fatty liver which is an indicator of alcoholism. Alcohol consumption also leads to what lay men call a sugar rush as epinephrine causes increased gluconeogenesis there is an increase in glucose levels hence they get excited very quickly and use up the vast energy reserves that they possess.

Effect of alcohol on Nor-Epinephrine :

When we concentrate on something the brainstem releases nor-epinephrine. The consumption of excessive alcohol deters that function of nor-epinephrine resulting in loss in focus and can lead to mental illnesses like depression, delusions, hallucinations, disorganised thoughts, speech and behaviour.

EFFECT OF SHORT TERM ALCOHOL INTAKE ON NEUROTRANSMISSION:

The main interdictory neurotransducer in the brain is GABA(Gamma aminobutyric acid). Its main functions are relaxation of the person giving them a state of decreased anxiety almost like a sedative. It acts through its receptors called $GABA_A$.(11)

Exposure to alcohol even for a short term causes an interdictory effect on these receptors. Exposure to alcohol also effects other interdictory neurotransducers like glycine and reportedly increases its functionality.

Alcohol also increases the interdictory neurotransmission by increasing neuromodulators like adenosine. The adenosine system causes sedation whereas the forbidion of this system causes stimulation. Short term influence of alcohol causes the increase in adenosine levels that in turn interacts with its receptors thus increasing the sedative like effects of alcohol.

Such an interaction takes place in the Purkinje cells of the cerebellum. The increased activation of the $GABA_A$ receptors occurs concurrently with the activation of receptors for norepinephrine because alcohol acts on norepinephrine receptors as well.

Alcohol has sedative like effects also because it forbids excitant neurotransmission by forbiding several excitant neurotransducers like aspartate and glutamate which act through the N-methyl D- aspartate receptors (NMDA) as well as non-NMDA receptors. The short term exposure to alcohol forbids the activity of both these receptors that leads in sedation.(12)

Certain complex brain activities and cognitive functions like consciousness, staying alert, memory that act together in a symphony together. The memory functions of the brain are regulated by a mechanism called long term potentiation(LTP) that helps in formation of

memories. The mechanism works due to the stimulation of excitant neurotransducers in the hippocampus(storage site of memories).(13) The exposure to alcohol even for a short amount of time causes the forbidion of glutamate receptors and activation of $GABA_A$ receptors which is exactly the opposite of what the mechanism needs to make memories. LTP plays a role in the memory storage mechanism that gets forbided due the consumption of alcohol.

EFFECT OF LONG TERM ALCOHOL INTAKE ON NEUROTRANSMISSION:

The brain tries to restore homeostasis after long term alcohol ingestion.(14)The short term effect of alcohol as compared to its long term effects are completely opposite. Prolonged drinking alters the $GABA_A$ receptors functionality be that due to decreased number of receptors or due to alterations of the protein site of the receptors.(15) This change in receptor levels brings about decreased sensitivity to neurotransmission.

Similarly the glutamate receptors increase their excitant activity to adapt to the interdictory effects of alcohol. A decrease in adenosine levels is also observed which acts a compensatory mechanism following long term consumption of alcohol.(16)

These compensatory mechanisms lead to several alcohol induced behavioral changes like development of alcohol tolerance which leads to the increase in level of alcohol intake since a person must drink more to obtain or perform a certain brain function.(17) Continuous drinking makes a person resistant to the short term effects of alcohol on the $GABA_A$ and glutamate receptors.(18) The resistance is developed due to the regulation between the neurocytes that produce many neurotransducers like vasopressin effects the body fluid equilibrium which in turn effects the tolerance of alcohol in the body.(19) The effect of alcohol not only depends on vasopressin but also vasopressin like neurotransducers like serotonin, norepinephrine and dopamine which have several regulatory functions.(20)

Conclusion:

Alcohol although a recreational drink should be consumed in a proper amount and not incessantly since too much consumption can cause alcohol dependence that eventually leads to the person becoming an alcoholic. The alcohol has a lot of short term effects that a person

experiences immediately on consumption that brings them back for more. The body acts in an adverse manner when exposed to alcohol some neurotransducers undergo excitant changes while some undergo interdictory changes.(21)

1. Dopamine release is increased in the body when consuming alcohol and makes the person very happy and motivated.(22) sustained drinking reduces the number of dopamine receptors in the body so in alcoholic people when they gradually stop drinking it causes a feeing of hopelessness and depression.
2. Alcohol acts as an agonist to GABA i.e, it binds to the GABA receptors and carries out the same activity as GABA.(23) This results in the person feeling lax, less anxious and tired.(24)Constant consumption of alcohol decreases the number of GABA receptors in the brain as a whole.(25)
3. Consumption of alcohol also decreases the levels of glutamate in the body leading to low energy levels and lethargy.(26)The effects of alcoholism and excess drinking is shown because of its effect on the NMDA receptors concerned with glutamate.(27)
4. Alcohol causes changes in the level of serotonin in the neurocyteal synapses and also causes a change in activities of serotonin receptors.(28)

We humans rely on our brain for almost all the activities we carry out during a day be it vital or non-vital.(29)The human body works like a perfect machine and the introduction of a foreign object like alcohol causes the harmony of the machinery to bend out of place and throwing everything out of balance.(30)The article gives as to how our brain acts in the presence of alcohol not even for a long time but short as well and is helpful to find a corrective methodic treatment for alcoholism.(31-36)

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