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**SUBJECT: PHARMACOLOGY**

 **“FINAL TERM”**

**QUES1) Explain the detailed neurotransmission process?**

**ANSWER) NEUROTRANSMISSION PROCESS:**

**Latin: transmissio “passage, crossing” from transmittere “send, let through”) is the process by which signaling molecules called neurotransmitters are released by the axon terminal of a neuron (the presynaptic neuron), and bind to and react with the receptors on the dendrites of another neuron (the postsynaptic neuron) a short distance away. A similar process occurs in retrograde neurotransmission, where the dendrites of the postsynaptic neuron release retrograde neurotransmitters (e.g. endocannabinoids; synthesized in response to a rise in intracellular calcium levels) that signal through receptors that are located on the axon terminal of the presynaptic neuron, mainly at GABAergic and glutamatergic synapse.**

**Neurotransmission is regulated by several different factors: the availability and rate-of-synthesis of the neurotransmitter, the release of that neurotransmitter, the baseline activity of the postsynaptic cell, the number of available postsynaptic receptors of the neurotransmitter to bind to, and the subsequent removal or deactivation of the neurotransmitter by enzymes or presynaptic reuptake.**

**In response to a threshold action potential or graded electric potential, a neurotransmitter is released at the presynaptic terminal. The released neurotransmitter may then move across the synapse to be detected by and bind with receptors in the postsynaptic neuron. Binding of neurotransmitters may influence the postsynaptic neuron in either an inhibitory or excitatory way. The binding of neurotransmitters to receptors in the postsynaptic neuron can trigger either short term changes, such as changes in the membrane potential called postsynaptic potentials, or longer-term changes by the activation of signaling cascades.**

**Neurons from complex biological neural networks through which nerve impulses (action potentials) travel. Neurons do not touch each other (except in the case of an electrical synapse through a gap junction); instead, neurons interact at close contact points called synapse. A neuron transports its information by way of an action potential. When the nerve impulse arrives at the synapse, it may cause the release of neurotransmitters, which influence another (post synapse) neuron. The postsynaptic neuron may receive inputs from many additional neurons, both excitatory and inhibitory. The excitatory and inhibitory influences are summed, and if the net effect is inhibitory, the neuron will be less likely to “fire” (I.e. generate an action potential), and if the net effect is excitatory, the neuron will be more likely to fire. How likely a neuron is to fire depends on how far its membrane potential is from the threshold potential, the voltage at which an action potential is triggered because enough voltage-dependent sodium channels are activated so that the net inward sodium current exceeds all outward currents.**

**QUES2) What does direct and indirect cholinergic agent means? Explain therapeutic application and adverse effects of cholinergic agents in detail?**

**ANSWER) CHOLINERGIC AGENT:**

**Cholinergic Agent are drugs that lead to stimulation of cholinergic receptors which include nicotinic and muscarinic receptors. These drugs can be divided into direct-acting agent and indirect-acting agent.**

**DIRECT CHOLINERGIC AGENT:**

**These drugs directly bind and activate nicotinic and muscarinic receptors with variable amounts of selectivity.**

**\*acetylcholine**

**\*bethanechol**

**\*carbachol**

**\*pilocarpine**

**INDIRECT CHOLINERGIC AGENT:**

**These drugs inhibit anticholinesterase the enzyme which destroys acetylcholine secreted into the synapse by the cholinergic neuron. By inhibiting destruction these drugs extend the half-life of synaptic acetylcholine and thus boost systemic cholinergic activity.**

**THERAPEUTIC APPLICATION:**

**In urologic treatment, bethanechol is used to stimulate the atonic bladder, particularly in postpartum or postoperative, nonobstructive urinary retention. Bethanechol may also be used to treat neurogenic atony (poor muscular condition) as well as megacolon (hypertrophy and dilation of the colon associated with prolonged constipation).**

**ADVERSE EFFECTS OF CHOLINERGIC AGENT:**

**=>Dry mouth**

**=>inhibition of sweating especially in your children**

**=>tachycardia and coetaneous vasodilate**

**=>blurring of vision**

**=>hallucinations and delirium**

**\*salivation**

**\*Diaphoresis**

**\*nausea**

**\*GI hyperactivity**

**\*miosis**

**\*urinary urgency**

**QUES3) (A) Explain the effects and adverse effects of organic nitrates in angina pectoris?**

**ANSWER) ADVERSE EFFECTS:**

**However, side effects during nitrate therapy are common. Headache is the most common side effect of nitrates; often dose-related and reported by up to 82% of patients in placebo-controlled trials. Nearly 10% of patients are unable to tolerate nitrates due to disabling headaches or dizziness. High doses can cause postural hypotension, flushing and tachycardia.**

**EFFECTS:**

1. **DILATION OF THE LARGE VEINS RESULTING IN POLING OF BLOOD in the veins which diminish the preload and reduces the work of the heart.**
2. **DILATES THE CORONARY VASCULATURE providing increased blood supply to the heart muscle.**

 **\*preload \*afterload \*relieving vasospasm \*redistribution blood flow**

**(B)Write down the treatment algorithm for improving symptoms of stable angina?**

**ANSWER) Treatment for stable angina includes lifestyle changes, medication, and surgery. You can usually predict when the pain will occur, so reducing physical exertion can help manage your chest pain. Discuss your exercise routine and diet with your doctor to determine how you can adjust your life style safely.**

**MEDICATION:**

**Nitroglycerin is a standard medicine for relieving the pain from stable angina. It relaxes coronary arteries, which reduces the workload of the heart.**

**LIFESTULE FACTORS:**

**Doctors will usually recommend that a person makes healthful lifestyle choice, such as eating a varied diet rich in whole grains, fruits and vegetables. They may also tell the person to look into stress-reducing techniques, such as yoga, meditation or breathing exercises. Light exercises of physical therapy can also reduce symptoms.**

**SURGERY:**

**An angioplasty is a common surgical procedure used to treat stable angina. It involves locating the problem area in the artery, then adding a permanent stent to widen it and hold it open. Angioplasty is a minimally invasive procedure, which should help prevent symptoms.**

**QUES4) (A) Differentiate between primary and secondary hypertension?**

**ANSWER) PRIMARY HYPERTENSION:**

**=>High blood pressure above 130 over 80 where no cause is known.**

**=>prevalence common, in 85% of people with high blood pressure.**

**=>family history of hypertension very common.**

**=>high BMI very common**

**=>Causes unknown but is suspected to be a combination of factors.**

**=>can be cured since the cause is not known it is not usually possible to cure the condition.**

**SECANDARY HYPERTENSION:**

**=>High blood pressure above 130 over 80 where the cause is known.**

**=>prevalence rare, in 15% or less of people with high blood pressure.**

**=>family history of hypertension not common.**

**=>high BMI not common.**

**=>causes. Tumor of adrenal gland causing overproduction of aldosterone, kidney disease, too little or too much thyroid hormone, problems with the renal arteries, sleep apnea. Alcohol and the use of oral contraceptives are also causing of hypertension.**

**=>can be cured in some cases the condition can be cured if the underlying cause is treated.**

**(c)What is the importance of pharmacological treatment of hypertension?**

**ANSWER) various groups of drugs are used for the treatment of hypertension, collectively these drugs are called as anti-hypertensive drugs, which includes.**

**DIURETIES: It helps the kidneys to inhibit the sodium reabsorption in the distal convoluted tubules, ascending limb and loop of Henle. E.G. chlorothiazide, furosemide.**

**BETA BLOCKERS:**

**These medications reducers the workload of the heart and blood vessel and causing the heart to beat slowly and with less force. E.G atenolol, propranolol**

**ALPHA BLOCKERS:**

**These medications cause the peripheral vasodilation of blood vessels. E.G prazosin**

**VASODILATORS:**

**These medications acting directly on the muscles in the wall of arteries and preventing the muscles from tightening and arteries from narrowing. E.G nitroglycerin, sodium nitro Pruside.**

**ACE INHIBITORS:**

**This group of medications will reduce the conversion of A- I to A-II and prevents vasoconstriction. E.G captopril, ramipril**

**CALCIUM CHANNEL BLOCKERS:**

**These medicines will block the movement of extra cellular calcium into the cells and causing vasodilation and decreased heart rate. E.G Amlodipine, verapamil.**

**(B)Explain the effect of renin on hypertension?**

**ANSWER) EFFECT OF RENIN ON HYPERTENSION:**

**Renin**

 **|**

**Angiotensin 1**

 **|**

 **Angiotensin 2**

 **|**

 **Aldosterone**

 **|**

 **Na+ retention**

 **|**

 **Blood volume (up)**

 **|**

 **Arteriolar wall pressure (up)**

 **|**

 **Blood pressure (up)**

**\*renin hormone is released from the juxtamedullary cells of kidneys.**

**\*angiotensin 1 is released from liver.**

**\*renin converts the angiotensin 1 to angiotensin 2.**

**\*angiotensin 2 stimulates the release of aldosterone from adrenal cortex.**

**\*aldosterone helps in the retention of na+ ions.**

**\*with each Na+ ion two water molecules are reabsorbed.**

**\*blood volume increases due to this increased water reabsorption.**

**\*Thus, due to high blood volume the blood pressure also increases.**

**QUES5(A) Differentiate between right heart failure and left heart failure?**

**ANSWER) DIFFERENCE:**

**RIGHT HEART FAILURE:**

**SYMPTOMS: Distended neck veins**

**\*peripheral edema \*lower extremity edema \*edema of hand dorsum \*eyelids \*anasarca... nausea, vomiting upper abdominal pain nocturia**

**SGNS of venous congestion:**

**Increased central venous pressure, positive hepatojugular reflux, congestive hepatomegaly. Cardiac cirrhosis**

**LEFT HEART FAILURE:**

**SYMPTOMS: Due mainly diastolic dysfunction:**

**\*dyspnea \*cardiac asthma \*pulmonary edema \*hemoptysis**

**Due mainly to systolic dysfunction:**

**\*exercise intolerance \*fatigue \*nocturia \*decreased mental and physical performance.**

**SIGNS of pulmonary congestion:**

**Moist rales, wheezing, abnormal sputum cytology**

**(B)Summarize the pharmacotherapy of heart failure?**

**ANSWER) DEFINITION:**

**HF is a complex clinical syndrome that results from any structural or functional impairment of ventricular filling or ejection of blood.**

**SYMPTOMS:**

**\*shortness of breath**

**\*swelling of feet and legs**

**\*chronic lack of energy**

**\*difficulty of sleeping at night due to breathing problems**

**\*cough**

**\*increased urination at night**

**\*confusion or impaired memory**

**GOALS OF PHARMACOTHERAPY:**

**Relief of congestion/ low cardiac output symptoms and restoration of cardiac performance.**

**\*inotropic drugs- digoxin, dobutamine, amrinone/ milrinone.**

**\*Diuretics: furosemide, thiazides.**

**\*Vasodilators: ACE inhibitors/ AT1 antagonist, hydralazine, nitrate.**

**\*Beta blockers: metoprolol, bisprolol, carvedilol.**