**Department of physiology**

**PhD Physiology**

**CELL PHYSIOLOGY**

**1-** Neurotransmitter & Synaptic transmission

A- Synaptic transmission

B-Overview of the structure and functions of neurons

C- The major chemical groupings of neurotransmitter

D- Storage and Release of Neurotransmitters

E- Vesicular transporters

F-Termination of Neurotransmitter Action

G- Synaptic Vesicles and Large Dense Core Vesicles

2- Types of Channels

A-MOLECULAR PROPERTIES OF ION CHANNELS

B-Selectivity of Ion Channels

C-Opening of Ion Channels

D-Closing of Ion Channels

E-Accessory Subunits of Channels

F- Voltage-Gated Cation Channels

G-Sodium Channels

H- Transient NA+ current

I- Persistent Na current

J- Rapidly inactivating & slowly inactivating Na+ channels

K- Regulation & therapeutic target of Na+ channels in nervous system

L- Ca2+ channels

M-L- type Ca channels

N-P/Q, N, and R ,Ca2+ channels

O-T- type Ca channels

P- Role of Auxilliary subunits of the High voltage Gated Ca2+ channels

Q- K channels (α subunit )

R-Voltage-gated K+ channels

S- KCNQ Kv channels

T-Ca2+ -gated K+ channels

U-Inward rectifier K channels

V-K(ATP) channels (Kir6.2)

Z- Potassium Channels malfunction

x- 2-pore channels :” Leak Current ”

w- Cyclic nucleotide-regulated channels

M- HCN channels

D- Cyclic nucleotide-gated channels(CNG)

F- Transient receptor potential(TRP)

G- acid sensing ion channels (ASIC)

H- Cl− channels

I-Phosphorylation of Ion Channels

3-Channelopathesis

1. Mutation of channel subunit proteins
2. B- Mutations of the Cl channels
3. The sodium channel in disease
4. Hyperkalemia Periodic Paralysis
5. Paramyotonia Congenita
6. Potassium-aggravated Myotonia
7. Hypokalemic Periodic Paralysis
8. Episodic Ataxia type -1(EA-1)
9. Episodic Ataxia type -2(EA-2)
10. Epileptic Syndromes
11. Generalized epilepsy with febrile convulsions plus (GEFC+)
12. Congenital Myasthenic Syndromes
13. Familial Hyperekplexia
14. Immune-mediated channelopathies
15. Isaacs syndrome
16. Myasthenia gravis
17. Biologic Toxins-1

4- LIGAND GATE CHANNELS

1. Cysteine-residue-containing receptor
2. The inotropic glutamate receptor
3. P2x purinoreceptors
4. Glutamate: Synthesis and Uptake
5. Glutamate plasma membrane transporters
6. inhibitors of glutamate transporters
7. inhibitors of glutamate transporters
8. NMDA Receptors
9. NMDA and AMPA Receptors
10. Metabotropic Glutamate Receptors
11. Glutamate and Cognition
12. Long-Term Changes
13. GABAA Receptors
14. GABA-T inhibitors
15. GABAB and GABAC receptors
16. 5-HT3

5-Transmitter Release

A-The Role of Calcium Ions

B-THE Exocytosis Cycle

C-The Function of SNARES

D-Synaptotagmin: The Ca2+ Sensor for Transmitter Release

E-Synaptotagmin: The Ca2+ Sensor for Transmitter Release

F-Additional Proteins Involved in Neurotransmitter Release

G-Endocytosis and Recycling: Clathrin-mediated endocytosis

H-Protein dynamin

6- Signal Transduction in the Brain

1. General patterns of signal transduction in the brain
2. G proteinfunction
3. ADP-ribosylation of G proteins by toxins
4. Regulators of G protein signaling
5. Second Messengers
6. PROTEIN PHOSPHORYLATION
7. Second Messenger–Dependent Protein Phosphorylation Cascades
8. Ca2+-dependent protein kinases
9. Protein kinase-anchoring proteins & Protein kinase inhibitors
10. Phosphatase
11. Protein phosphatase inhibitors

7- NEUROTROPHIN Signaling and Gene expression

1. Overlap between neurotransmitter & NF
2. Different between neurotransmitter&NF
3. Neurotropin family
4. p75 receptor
5. Neurotrophins and Synaptic Plasticity
6. GDNF Family
7. JAK–STAT Pathway
8. CNTF
9. Immune-Response Cytokines
10. Chemokines
11. Cytoplasmic Protein Tyrosine Kinases
12. Protein Tyrosine Phosphatases
13. Signaling to the Cell Nucleus
14. Regulation of Gene Expression by Chromatin
15. Regulated Steps of Transcription
16. Posttranscriptional Regulation
17. Poly-A tail and Guanosine cap
18. Translation
19. Post translational Modifications
20. Stability of Proteins
21. Micro RNAs
22. Transcription Factors:Key Regulators of Gene Expression
23. Regulation of CREB by cAMP, Ca2+, and growth factors
24. CREB mediation of neural plasticity
25. AP-1 Family of Transcription Factors
26. Activation of cellular genes by AP-1