**LECTURE SYLLABUS**

**(General medicine)**

**Pathophysiology of the nervous system**

**Introduction**

Functional and structural characteristics of the nervous system activity in health and disease **(**neuromediators, receptors)

1. Synthesis of the mediator in the presynaptic formation
2. Storage of the mediator in the presynaptic formation and its delivery to the synaptic cleft
3. Interaction with the postsynaptic membrane receptor
4. Removing the mediator from the synaptic cleft



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###### Etiological factors affecting the nervous system

General features (role of the reactivity of the organism)

Relationship of the external and internal factors

**General features of pathogenetical mechanisms of nervous dysfunctions**

**Brain edema –** core,consequences (complication and pathogenetical factor of many pathological states)

**Mitochondrial dysfunction**

Basis of mitochondrial functions

1. disturbances evoked by mutations mtDNA and nDNA in genes coding mitochondrial functions (changes of mitochondrial genome, evoked defects of mtDNA)
2. consequences of mtDNA defects
3. mitochondrial disturbances evoked by external factors

**Neurochemical basis of the pathophysiology of trauma**

Excitotoxicity of glutamate (core, possibilities of influencing it and prevention)

**Survey of basic neuropathological terms**

Irritative or hyperfunctional and extinct or hypofunctional disturbances.

Irritative disorders of the motor system (Jackson´s motor epilepsy, tremor, myoclonia, hyperkinesia…)

Extinct disorders of the motor system (paralyses – central, peripheral, pareses, plegias, ataxia, abasia, astasia)

Irritative disorders of the afferent system (Jackson's sensitive epilepsy, paraesthesia, hyperesthesia, dysaesthesia, causalgia, neuralgia, phantom pain, hyperalgesia, aura - basically pseudohalucinacea - deceptive perception of visual, olfactory or sensory qualities, aura, psychological aura)

Extinction disorders of the afferent systems (hypoaesthesia, anesthesia, thermogenesis, bathyanesthesia, hypocalcaemia, hypacusis, anacusis, amaurosis, hemianopsia, scotomy, hypogeusia, ageusia, hyposmia, anosmia).

Disturbances of the vegetative nervous systém

Concern both the central and peripheral parts of the autonomic nervous system (trophic disorders, blood circulation, vegetative dystonia)

**Maintenance and recovery of the NS integrity**

Plasticity of the NS

a) redundancy (excess neurons and physiological extinction)

b) alternation (another structure will take over the function of the defunct center)

c) vicarious function (the lost function is partly taken over by another modality eg. visual-hearing

d) diaschisis (temporary removal from function)

Critical developmental periods (brain growth spurt and CNS vulnerability)

**Neurotransplantation**

Principles, present state of research and practice (examples)

**Methods of research and examination of neural functions**

Reflex examination, examination of motor functions

Sensory perception examination

Stimulative methods

Macroelectrophysiological recording methods

EEG, ERP (EP)

Microelectrophysiological methods

Unit activity, voltage clamp, patch clamp

Stereotaxis

Depictive examination methods

Thermography, sonography, X-ray examination, computer tomography, scintigraphy, magnetic resonance imaging (MRI)

Brain mapping positron emission tomography

**Genetically determined diseases of the NS**

(Changes in chromosome equipment, inborn disorders of metabolism with impacts on nerve function)

Diseases with preferential CNS affection

Multi-organ affections, including NS

Congenital metabolic disorders with CNS impact

**Diseases with predominance of external factors**

Physical factors, nutrition, intoxication, neuroinfection (bacterial, viral, prion)

**Diseases with combined and unclear etiology**

Neuroimmunological diseases

Tumors

Degenerative diseases

Demyelination with mixed etiology

Subacute combined spinal degeneration Sclerosis multiplex, epilepsy

Parkinson´s disease, schizophrenia

Alzheimer ´s disease

**Pathophysiology of the spinal cord**

Spinal syndromes

Spinal transverse interruption syndrome, spinal shock

Spinal hemisyndrome /Brown-Sequard sy/

Tabic dissociation of sensation (dorsal spinal columns sy)

Syndrome of the lateral spinal columns

Syringomyelic dissociation of sensation (grey commissure sy)

**Disorders of the spinal vegetative systems**

Syndromes from cervical sympathetic disorders (Claude-Bernard-Horner, ganglia stellati)

Disorders of urination and defecation

**Pathophysiology of the brain stem**

Reticular formation, decerebration rigidity

Sy "cerveau isolé"

Sy "encéphale isolé"

Bulbar paralysis, pseudobulbar syndrome, alternating syndromes

**Pathophysiology of the cerebellum**

The role of the cerebellum in motor, cognitive and emotional functions

New conception of the cerebellum

Cerebellar syndromes: extinct (dysfunctional, irritative, cognitive-affective)

Cerebellar ataxia

**Pathophysiology of the diencephalon**

(thalamus a metathalamus, hypothalamus, epithalamus, subthalamus)

Pf of the thalamus

Thalamic syndromes, thalamic pain

Pf of the hypothalamus

Food and fluid intake, sexual function, hormonal function, thermoregulation, vegetative nervous system control

##### Pathophysiology of the cerebral hemispheres

Pf of basal ganglia

Hypertonic-hypokinetic sy,

Hypotonic -hyperkinetic sy

Pf of the brain cortex

Pf of the allocortex - the limbic system, (the hippocampus and amygdala)

Pf of the neocortex - primary projection areas, association areas, effector areas (motor, vegetative, suppressor), frontal lobe sy (prefrontal lobotomy), aphasia, alexia, agraphia, apraxia, dyslexia

**Behavior and its disorders**

Instinctual behavior, motivation, drives (respiratory, hunger, thirst, sexual)

Emotions (feeling affects, fear, joy, rage, mood...), vegetative components, startle, freezing

Highest (cognitive) nervous functions (HNF)

Conditioning (time relationships, appetitive and aversive conditional reflexes),

Excitation, inhibition, induction

Learning and memory (associative, non-associative), short-term (working), intermediate,

Long-term (reference)

HTSIF and integration

Neural typology: Pavlov (Hippocrates), Kretschmer, Friedman and Rosenman.

HNF disorders

Neurosis, psychosis, organic disorders (neural and non-neural origin)

**Life rhythms**

Circadian rhythm, pacemaker, melatonin

Sleep (REM, non-REM), sleep disorders

#### Neurohumoral and visceral regulations

Neurovegetative dystonia, psychosomatic diseases