

# PHYSIOPATHOLOGIE EN NEUROLOGIE ET PSYCHIATRIE

**Mardi 22 Novembre**

Durée total de l'examen : 2 heures

Vous devez répondre aux deux sujets. PENSEZ à indiquer votre numéro d'étudiant sur les feuillets de réponse (page 2 **et** 3).

Total examination duration: 2 hours

You must respond to the two exams topics. REMEMBER to indicate your student number on pages 2 **and** 3 of this examination paper.

Numéro étudiant/  
Student number : \_ \_ \_ \_ \_

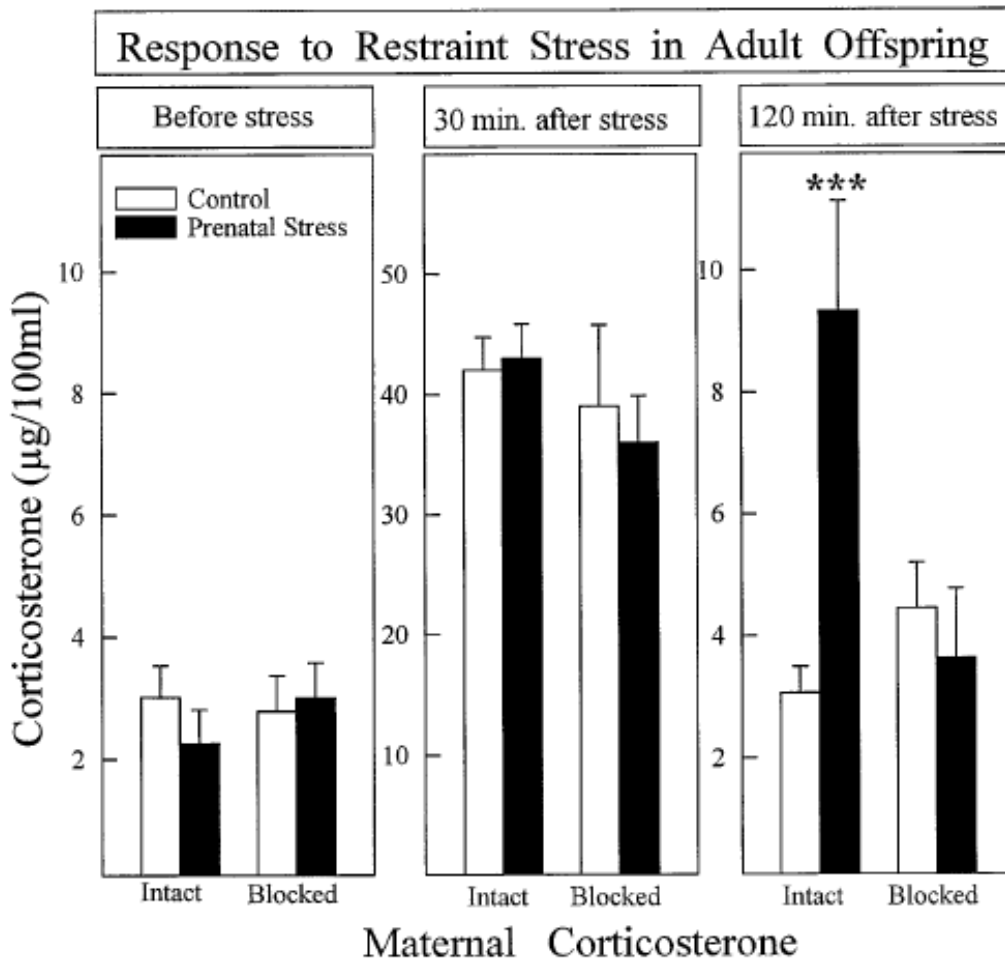
**MCQ exam (20 pts)**  
**Test duration: 1 hour**

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This exam contains 40 multiple choice questions, each worth 0.5 points.

Indicate with a cross the correct response(s) for each question. Each question could have several correct answers. Make sure that your answer is clearly marked.





*Figure 1.* Plasma corticosterone secretion after restraint stress in control and prenatally stressed offspring of mothers with intact (14–20 animals/group) or blocked (7–10 animals/group) stress-induced corticosterone secretion. The experimental groups did not differ in corticosterone secretion in basal conditions (*left panel*) or 30 min after stress (*middle panel*). At 120 min after stress (*right panel*), prenatally stressed animals, the mothers of which were in the intact group, had higher corticosterone levels than controls. Prenatally stressed rats whose mothers' corticosterone secretion was blocked did not differ from controls. \*\*\* $p < 0.001$ . Error bars represent SEM.

**Q2. What is the main hypothesis tested in this experiment ?**

**Q3. Briefly describe the methods.**

**Q4. Describe the main results of the experiment.**

**Q5. Conclude and discuss the results.**

***Max 1 page***





## MCQ exam

Mark your answers on the answer sheet (page 2 of the second document)

1. **Which enzyme induced by cytokines is responsible for the catabolism of tryptophan within the kynurenine pathway?**
  - a) Tryptophan hydroxylase (TPH)
  - b) Indoleamine 2,3-dioxygenase (IDO)
  - c) Monoamine oxydase (MAO)
  - d) Kynurenine aminotransferase (KAT)
  - e) Tetrahydrobiopterin (BH4)
  
2. **In which of the following aspects, sickness behavior resembles major depression?**
  - a) Intensity/severity
  - b) Duration
  - c) Symptoms dimensions
  - d) Adaptive response to help the body to recover from pathogens
  - e) Requires treatment with antidepressants
  
3. **Which statement does not apply to interferon-alpha induced depression?**
  - a) Occurs in almost every patients treated with the cytokine
  - b) Involves inflammation-induced neurotoxic processes
  - c) Develops in two phases
  - d) Relies on vulnerability factors
  - e) Can be prevented by antidepressant treatment
  
4. **In patients with major depressive disorder, abnormalities of the HPA axis include:**
  - a) decreased expression of CRF mRNA in the prefrontal cortex, as compared to normal healthy subjects
  - b) increased levels of ACTH in plasma, as compared to normal healthy subjects
  - c) decreased levels of cortisol in plasma, as compared to normal healthy subjects
  - d) decreased levels of vasopressin in CSF, as compared to normal healthy subjects
  - e) increased levels of free cortisol in urines, as compared to normal healthy subjects
  
5. **The cortisol awakening response is correlated with several clinical dimensions/symptoms of major depression including:**
  - a) anhedonia
  - b) anxiety
  - c) anorexia
  - d) insomnia
  - e) general distress
  
6. **The cortisol response to the combined dexamethasone/CRF test is considered as a predictive marker of:**
  - a) the susceptibility to major depression
  - b) the therapeutic response to antidepressants
  - c) the propensity to relapse of major depression
  - d) the vulnerability to experience anxiety symptoms
  - e) the occurrence of cognitive disturbances

- 7. In patients with obsessive-compulsive disorder (OCD), there are significant functional abnormalities within the frontal-subcortical loops during symptom provocation paradigms with:**
- hypoactivation within the orbitofrontal cortex, as compared to normal healthy subjects
  - hyperactivation within the anterior cingulate cortex, as compared to normal healthy subjects
  - hyperactivation within the caudate nucleus, as compared to normal healthy subjects
  - hyperactivation within the thalamus, as compared to normal healthy subjects
  - hypoactivation within the amygdala, as compared to normal healthy subjects
- 8. Standard treatments of OCD, including antidepressant medications and cognitive-behavioral therapies are known to:**
- reduce the functional activity within the orbitofrontal cortex of OCD patients
  - reduce the functional activity within the anterior cingulate cortex of OCD patients
  - increase the functional activity within the caudate nucleus of OCD patients
  - increase the functional activity within the thalamus of OCD patients
  - increase the functional activity within the hippocampus of OCD patients
- 9. In OCD patients and their first-degree relatives, several cognitive and behavioral processes are known to be disrupted including:**
- cognitive flexibility
  - autobiographic memory
  - decision making
  - error detection
  - motor impulsivity
- 10. The pathophysiology of Parkinson's disease can involve all these mechanisms except:**
- The loss of dopaminergic neurons of the nigro-striatal pathway
  - The loss of GABAergic neurons of globus pallidus
  - The loss of glutamatergic neurons in the paralimbic cortex
  - The loss of noradrenergic neurons of the locus coeruleus
  - The serotonergic neurons of the raphe nucleus
- 11. Parkinson's disease is characterized by all these symptoms except:**
- Tremor at rest
  - Bradykinesia or akinesia
  - Muscle rigidity
  - Dyskinesias characterized by involuntary abnormal movements
  - Paresthesia and headache

**12. Among the following propositions, select the correct proposition(s):**

- a) GABAA receptor agonists improve motor symptoms of Parkinson's disease
- b) L-Dopa induces a dramatic improvement of motor symptoms in the advanced stages of the disease
- c) Deep brain stimulation of the subthalamic nucleus is a therapy of choice when L-Dopa induces dyskinesia
- d) Deep brain stimulation of the subthalamic nucleus leads to an improvement of motor symptoms accompanied by dyskinesias
- e) Additional lesion of the noradrenergic system alters the beneficial effect of deep brain stimulation of the subthalamic nucleus on motor symptoms in the 6-OHDA rat model of Parkinson's disease

**13. Among the following propositions, select the correct proposition(s):**

- a) D1 are the most abundant dopamine receptors in the globus pallidus
- b) D2 receptors located in the subthalamic nucleus are involved in the burst discharge pattern
- c) D5 receptors located in the subthalamic nucleus are involved in the tonic discharge pattern
- d) D1 receptors are located on striatal neurons of the direct pathway projecting to the output structures of the basal ganglia
- e) D2 receptors are located on the striatal neurons of the indirect pathway projecting to the globus pallidus (GP in rodents and GPe in primates)

**14. Among the following propositions, select the correct proposition(s):**

- a) Dopamine neurons of the pars compacta of substantia nigra project exclusively on the striatum
- b) Dopamine depletion into the globus pallidus decreased the firing rate of globus pallidus neurons
- c) Dopamine depletion into the globus pallidus increased the percentage of bursty neurons in the subthalamic nucleus
- d) Local injection of D5 receptor inverse agonist into the subthalamic nucleus changed bursty activity to a tonic activity
- e) D5 receptors located in the subthalamic nucleus can be proposed as a target in the treatment of Parkinson's disease

**15. Multiple sclerosis is a disease :**

- a) with a subacute course
- b) affecting the central nervous system
- c) Inflammatory
- d) inherited
- e) affecting preferentially the elderly

**16. Cognitive disturbances in multiple sclerosis :**

- a) could occur at all stages of the disease
- b) increased the risk of unemployment
- c) concern mainly language
- d) are characterized by information processing speed impairment
- e) spared executive functions

**17. Cognitive impairment in multiple sclerosis:**

- a) cannot be detected by asking questions about cognition to the patient
- b) can be detected in many patients by a single test assessing information processing speed
- c) can be detected in many patients by a single test assessing episodic memory
- d) can be assessed by the Mini Mental Status (MMS)
- e) is more severe in patients with a lower educational background than in more educated people with the same burden of disease lesions on MRI.

**18. Cognitive disturbances in multiple sclerosis :**

- a) correlate weakly with lesion load on MRI
- b) correlate strongly with brain atrophy at the early stages of the disease on MRI
- c) correlate with diffuse white matter involvement at early stages of the disease on MRI
- d) do not correlate with MRI parameters in highly educated patients
- e) correlate specifically with frontal lobe lesion load on MRI

**19. Brain activity during a cognitive task performed normally by a patient with multiple sclerosis:**

- a) is characterized by a decreased activity in the brain area associated with the task
- b) is associated with the same pattern of recruitment of brain areas than healthy subjects
- c) is characterized by recruitment of additional cerebral areas normally not involved in the task
- d) is dependant of the extent of diffuse brain tissue injury
- e) is limited in complex tasks

**20. The cerebellum**

- a) is involved in cognition in healthy subjects
- b) is functionally linked to the frontal lobe
- c) is activated during some automatic cognitive tasks in healthy subjects
- d) is activated during complex cognitive task in multiple sclerosis patients
- e) could be more activated after cognitive rehabilitation in multiple sclerosis patients

**21. As a whole, the prefrontal cortex is involved:**

- a) In goal-directed behavior
- b) In the analysis of somatosensory information
- c) In attentional processes
- d) In episodic memory
- e) In mental flexibility

**22. The orbito-frontal cortex**

- a) Is located in the lateral part of the hemispheres
- b) Encompasses area 9, 46, 24 and 10
- c) Is involved in mental flexibility
- d) When damaged may lead to sociopathic behavior
- e) Plays a critical role in error detection

- 23. Lesion in the orbito-frontal cortex may induce**
- a) Difficulties to change an on-going strategy
  - b) An emotional lability
  - c) Language disorders
  - d) Behavioral disinhibition
  - e) Difficulties in decision-making
- 24. The anterior cingulate cortex**
- a) May be involved in the pathophysiology of ADHD
  - b) Its lesion may lead to a akinetic-mutism syndrome
  - c) Seizures in this region may mimic OCD
  - d) Is a major area for somatosensory integration
  - e) Is involved in conflict monitoring
- 25. Despite the reduction in ATP production, what is the other consequence of impaired mitochondrial respiration?**
- a) Increased production of reactive oxygen species
  - b) Increased of protein synthesis
  - c) Mitochondria biogenesis
  - d) Mitosis
  - e) No other consequence
- 26. Mitochondrial dysfunction in PD has been linked to Parkinson disease. What are the evidences?**
- a) Reduced complex I activity
  - b) Increased production of mitochondrial-derived ROS
  - c) ROS-mediated mtDNA damage
  - d) Reduced complex I activity and increased production of mitochondrial-derived ROS
  - e) Reduced complex I activity, Increased production of mitochondrial-derived ROS and ROS-mediated mtDNA damage
- 27. What are the pathways converging into lysosomes?**
- a) Macroautophagy, chaperone-mediated autophagy, endocytosis, phagocytosis, microautophagy
  - b) Macroautophagy, chaperone-mediated autophagy, endocytosis, phagocytosis
  - c) Macroautophagy, chaperone-mediated autophagy, phagocytosis, microautophagy
  - d) Macroautophagy, endocytosis, phagocytosis, microautophagy
  - e) A: Macroautophagy and endocytosis
- 28. Attention Deficit Hyperactivity Disorder:**
- a) Is an heterogeneous disorder
  - b) Is associated with stereotyped behaviors
  - c) Is characterized by Hyperactivity-impulsivity
  - d) Ends at the age of 12 years
  - e) All answers are correct

- 29. Attention Deficit Hyperactivity Disorder:**
- a) Is a social construct
  - b) Is always a genetic disorder
  - c) Is always determined by the environment
  - d) Is conceptualized as a neurodevelopmental disorder
  - e) Results from the combination of genetic and environmental factors
- 30. The following dimensions can be altered in Attention Deficit Hyperactivity Disorder:**
- a) Executive functions
  - b) Emotional regulation
  - c) Non executive functions
  - d) Communication
  - e) Sleep
- 31. Evolution with age of Attention Deficit Hyperactivity Disorder:**
- a) can lead to substance use
  - b) can lead to higher rates of traumas
  - c) can be associated with low self-esteem
  - d) can be associated with higher rates of road crashes
  - e) can improve
- 32. The link between Attention Deficit Hyperactivity Disorder and addictions:**
- a) Can be due to a common vulnerability
  - b) Can result from reverse causality
  - c) Can be confounded by behavioral disorders
  - d) Is systematic
  - e) Is rare
- 33. Attention Deficit Hyperactivity Disorder and bipolar disorder:**
- a) Can be comorbid
  - b) Overlap in several symptoms
  - c) Are easy to distinguish
  - d) Can share the symptom of motor hyperactivity
  - e) All answers are correct
- 34. Which are the 4 clusters of PTSD symptoms**
- a) Re-experiencing
  - b) Cognition alteration
  - c) Avoidance/forgetting
  - d) Hyper-arousal
  - e) General anxiety
- 35. Which functional and structural changes corresponds to PTSD**
- a) Hypoactivation of the prefrontal cortex
  - b) Hyperactivation of the prefrontal cortex
  - c) Reduced hippocampal volume
  - d) Increased amygdala volume
  - e) Hyperactivation of the amygdala

- 36. Risks factors for PTSD**
- a) Blood cortisol levels
  - b) Previous traumatic experience
  - c) Hyperactivation of the amygdala
  - d) Family history of PTSD
  - e) History of drug abuse
- 37. Following extinction learning, which are the behavioral procedure used to evaluate if fear memory has been permanently erased?**
- a) Re-extinction
  - b) Spontaneous fear recovery
  - c) Context dependent fear renewal
  - d) Safety learning
  - e) Reinstatement
- 38. What are the perineuronal nets**
- a) subpopulation of excitatory neurons
  - b) highly organized form of proteoglycans
  - c) subpopulation of inhibitory neurons
  - d) Glial cells
  - e) Elements of the extracellular matrix
- 39. Which of the following statements about monoamine oxidase (MAO) enzyme distribution are true?**
- a) MAO-B are highly represented in the brain
  - b) MAO-A are highly represented in the brain
  - c) MAO-A are highly represented in the gastrointestinal tract
  - d) MAO-B are highly represented in blood platelets
  - e) MAO-A are not present in the liver
- 40. Which of the following statements concerning the Catechol-O-methyltransferase (COMT) enzyme are true?**
- a) COMT participate in the metabolism of levodopa and dopamine
  - b) COMT degrade dopamine into 3-O-methyldopa
  - c) COMT degrade levodopa into 3-O-methyldopa
  - d) 3-O-methyldopa facilitates the transfer of levodopa across the blood brain barrier
  - e) Selegiline is a selective COMT inhibitor