Name:

Midterm BioMed 370 Brain and Behavior  
February 25, 2004

I-4. Match the following

1. cocaine  A. potent post-synaptic dopamine receptor blocker  
2. levodopa  B. pre-synaptic neurotransmitter precursor  
3. haloperidol  C. post-synaptic blocker of serotonin and dopamine receptors  
4. clozapine  D. inhibitor of dopamine reuptake  
   E. monoamine oxidase inhibitor

5-8. Match the following

5. donepezil  A. glutamate NMDA receptor antagonist  
6. clonidine  B. acetylcholinesterase inhibitor  
7. benzodiazepines  C. enhances GABA activity at the post-synaptic receptor  
8. memantine  D. GABA presynaptic reuptake inhibitor  
   E. noradrenergic presynaptic receptor agonist

9. Indicate which of the following characteristics of a drug will aid in its getting into the brain following peripheral administration:

A. Being a brain neurotransmitter  
B. Being lipophilic  
C. Having at least one free OH group  
D. A and B  
E. B and C

10. Indicate which of the following pairings are correct:

A. Norepinephrine: Inactivation in the synaptic cleft via neuronal reuptake  
B. Acetylcholine: Inactivation in the synaptic cleft via enzymatic metabolism  
C. Dopamine: Synaptic inactivation via enzymatic metabolism  
D. A and B  
E. B and C

11-14. Match up the numbered brain neurotransmitter with the single most appropriate lettered choice for the neurotransmitter category. Each lettered choice may be used once, more than once, or not at all.

11. Serotonin  A. Amino Acid  
12. Enkephalin  B. Biogenic Amine  
13. GABA  C. None: the compound is not a brain neurotransmitter  
14. Dopamine  D. Peptide
15. All of the following peripheral drug administration: drug effect pairings are correct except:

A. L-DOPA: increase in dopamine levels in the brain
B. Fluoxetine: inhibition of serotonin reuptake in the brain
C. Amphetamine: inhibition of dopamine release in the brain
D. Phenelzine: inhibition of monoamine oxidase activity in the brain
E. Desipramine: inhibition of norepinephrine reuptake in the brain

16. J.R., a 26-year-old female, is started on drug therapy for unipolar depression. Soon afterwards she complains of a dry mouth and constipation. Indicate the most likely drug J.R. has been taking.

A. Lithium
B. Phenelzine
C. Carbamazepine
D. Fluoxetine
E. Imipramine

17. W.J., a 42-year-old male, is started on drug therapy for unipolar depression. Following a wine and cheese party in which he had a good helping of a cheese fondue, he develops heart palpitations and a pounding headache. Upon examination, you find that his blood pressure is greatly elevated. The most likely explanation for his increase in blood pressure:

A. He is probably taking fluoxetine, which facilitates the production of a hypertensive agent from cheese
B. He is probably taking imipramine, which combines with a substance in cheese to produce a hypertensive agent
C. He is probably taking lithium, which potentiates the norepinephrine-releasing action of cheese
D. He is probably taking a monoamine oxidase inhibitor, which prevents the metabolism of a hypertensive agent in cheese
E. He probably stopped taking fluoxetine, which would produce a sensitization of norepinephrine receptors to the hypertensive action of cheese

18. The following observations have been made with regard to bipolar depression (manic-depressive disorder):

L-DOPA can produce manic symptoms
MHPG levels are normal during mania
Inhibiting catecholamine synthesis inhibits mania
Haloperidol reduces mania

The most logical conclusion to draw about mania from these observations is that mania is due to:

A. An underactive norepinephrine system in the brain
B. An overactive dopamine system in the brain
C. An overactive norepinephrine system in the brain
D. An underactive dopamine system in the brain
E. Underactivity of both norepinephrine and dopamine in the brain
19. The main pharmacological action of diazepam (Valium: a benzodiazepine) that is thought to be related to its anti-anxiety effects:

A. Inhibition of serotonin reuptake
B. Stimulation of dopamine release
C. Potentiation of GABA action
D. Inhibition of acetylcholine metabolism
E. Inhibition of norepinephrine reuptake

20. In fronto-subcortical circuits that mediate complex behaviors, projections from the frontal cortex to the basal ganglia then project to this structure before returning to the frontal cortex.

A. Hippocampus
B. Association cortex
C. Nucleus accumbens
D. Midbrain
E. Thalamus

21. Damage to the fronto-subcortical circuits can result in behavioral dysregulation as seen in various diseases. In OCD, there appears to be decreased activity in fronto-subcortical circuits involved in impulse regulation.

A. True
B. False

22-25 Name the white matter tract that best corresponds to the following descriptions:
22. Tract that carries information to the mammillary bodies from the hippocampus
23. Tract that carries information from the amygdala to the septal nucleus
24. Tract that carries information from the amygdala to the hypothalamus and brainstem
25. Tract that carries information from the anterior cingulate gyrus back to the hippocampus

A. cingulum bundle
B. stria terminalis
C. anterior commissure
D. ventral amygdalofugal pathway
E. fornix
26-28
26. What type of imaging is shown above?
   A. T1 weighted MRI
   B. T2 weighted MRI
   C. CT scan
   D. FLAIR image
   E. PET scan

27. The abnormality above can be best described as a:
   A. A wedge-shaped hypodensity of the right frontal lobe
   B. A wedge-shaped hypodensity of the left frontal lobe
   C. A wedge-shaped hyperdensity of the right frontal lobe
   D. A wedge-shaped hyperdensity of the left frontal lobe
   E. A lacunar infarct

28. After reviewing her imaging, you astutely suggest to your attending that her lack of motivation and drive is most likely secondary to a lesion in which of the following areas?
   A. Orbitofrontal cortex
   B. Primary sensory cortex
   C. Primary motor cortex
   D. Anterior Cingulate cortex
   E. Premotor cortex

29. Ingestion of L-tryptophan increases levels of which substance in the brain?
   A. Acetylcholine
   B. Serotonin
   C. Domapine
   D. GABA
   E. Norepinephrine
30. The key action of which transmitter directly involves opening of a chloride channel?
   A. Serotonin
   B. Norepinephrine
   C. Glutamate
   D. GABA
   E. Dopamine

31. Which pair does not fit in the treatment of neuropsychiatric disorders?
   A. Parkinson’s disease-dopamine agonist
   B. Depression-serotonin reuptake inhibitor
   C. Alzheimer’s disease-acetylcholinesterase inhibitor
   D. Schizophrenia-dopamine agonist
   E. Epilepsy-GABA agonist

32-35
32. Receives primary sensory input from the olfactory stria
33. Injured in Wernicke-Korsakoff syndrome
34. Degenerates in Huntington’s disease
35. Involved in forming episodic memories
   A. Hippocampus
   B. Caudate nucleus
   C. Mamillary bodies
   D. Amygdala
   E. Substantia nigra

36. During testing of a patient with a prior history of head trauma, you ask him to draw as many figures of different shapes as he can in 2 minutes. When you examine his paper, you note that all his figures look quite similar. You then ask him to copy rows of repeating figures. During the third task, you realize that he has reverted to copying the first row and not the third. Which frontal zone do you suspect to be the most affected?
   A. Premotor
   B. Frontal Eye Field
   C. Dorsolateral
   D. Orbitofrontal
   E. Primary Motor
37-40 Use A-D above
37. Stroke
38. Abscess
39. Multiple sclerosis
40. Degenerative disorder

41-44 Match the following with A-D above
41. FLAIR MRI
42. Non-contrast CT
43. T1 MRI
44. Contrast-enhanced CT

45-47 A 23 year old medical student has had recurrent intrusive thoughts of failing medical microbiology, which cause him marked anxiety. Instead of studying, however, he spends most of his time highlighting his notes in different colors without ever actually reading them, which temporarily relieves some of the anxiety. While acknowledging that this behavior is irrational, the student notes that it is often the only thing that can help him feel better.

45. This student is most likely to have a family member with which of the following disorders?
   A. Tourette’s Syndrome
   B. Schizophrenia
   C. Bipolar disorder
   D. Klruver Bucy syndrome
   E. Psychotic disorder due to medical school

46. Treatment with which of the following pharmacological agents would be most effective for long-term control of his symptoms?
   A. Clozapine
   B. Haloperidol
   C. Fluoxetine
   D. Amphetamine
   E. Diazepam
47. Which of the following patterns of neural activity would be revealed by functional imaging studies of this student's brain?
A. Decreased activity in frontal-subcortical circuits
B. Increased activity in the orbital frontal cortex, anterior cingulate, and caudate
C. Increased activity in the precentral gyrus
D. Increased activity in the dorsolateral prefrontal cortex and decreased activity in orbital frontal cortex

48-50 A 58-year-old woman presents complaining of depressive symptoms. She reports feeling dysphoric, tearful, and having suicidal ideation for the past two weeks. Her symptoms began after she lost more than $25,000 gambling. She says that she lost this amount over the course of a weekend, during which she had felt boundless energy, and was able to gamble continuously for the weekend without sleeping. She says she felt “on top of the world” at the time, even after losing, and it was only a week later when it began to dawn on her what had happened. She reported that this has happened several times before--she estimates two or three times a year, during which time she has also lost money gambling, though never to this extent. Currently she appears sad and bewildered on exam, saying “I can’t explain my behavior--I don’t even really enjoy gambling.”

48. What was the most likely cause of the patient’s large gambling loss?
A. An episode of mania
B. An episode of hypomania
C. An episode of depression
D. An episode of mixed mania and depression.

49. Of the following, what is the patient’s most likely diagnosis?
A. Mania
B. Bipolar disorder type I
C. Major depression
D. Schizoaffective disorder
E. Cyclothymia

50. Which of the following would further support the diagnosis most reliably?
A. A family history of similar behavior
B. An abnormal dexamethasone suppression test
C. A history of drug or alcohol use.
D. Evidence of secondary gain associated with the gambling.

51-54 A 72-year-old woman has been successfully treated for major depression. This is the fourth episode of depression during her adult life. During the previous episode, 3 years prior, she responded well to a regimen of nortriptyline (a TCA) 75 mg a day, and recalls no significant adverse effects from the drug. Now the patient presents with dysphoria which began about a month ago, and has worsened since. During the same time, she has noticed increased irritability and anxiety, with poor sleep and appetite. Regarding the latter, she estimates she has lost 10 pounds in the last month (she is 5'6", 160 lbs.).
The patient says that her biggest problem is her lack of sleep, and her anxiety, and she believes that if that were treated for a week or so, her mood would improve. You feel this is a reasonable approach.

51. Which of the following would be the most effective *palliative treatment* for this patient?
A. Nortriptyline  
B. Fluoxetine  
C. Lorazepam  
D. Haloperidol  
E. Methylphenidate

52. The patient comes back after two weeks, and says that her sleep and anxiety indeed are better. However, she continues to feel irritable and dysphoric. She is willing to try a *more curative treatment* at this point. Of the following, which of the following is more likely to be an efficacious curative treatment for this patient?
A. Nortriptyline  
B. Fluoxetine  
C. Lorazepam  
D. Haloperidol  
E. Methylphenidate

53. The patient returns after three days, saying that your curative treatment has not been helpful. At this point, you should,
A. Reassure the patient and continue the current regimen  
B. Discontinue treatment and start an alternative medication  
C. Add an adjunctive medication to the current treatment  
D. Continue the current medication, but increase the dose.

54. The patient responds to your treatment, but then requests to be taken off her medication. She explains that the medication is causing significant sexual side effects. Since being on the medication, she has noticed a drying of her vaginal mucus membranes, making intercourse painful. In addition, she believes her libido is decreased since being on the medication. However, she admits it is difficult to know if this is an independent effect or whether it relates to the prior side effect. At this point you should:
A. Suggest the use of a topical lubricant, and to consider estrogen therapy.  
B. Begin a trial of lowering the medication dose to see if the side effects improve.  
C. Counsel her that these symptoms are a normal part of aging.  
D. Switch the medication to paroxetine, an SSRI, which may have fewer side effects.  
E. Chastise her that elderly people should not be so preoccupied with sex.
A 25-year-old medical student is brought to student health by concerned colleagues. Previously a normal, well functioning student, for the past month he had not been going to class, and his behavior seems increasingly bizarre to his friends. He is up all night, and tends to talk “a mile a minute.” On initial interview he tells the doctor the following:

Sure I know why I’m here. These police who brought me, they’re afraid of me—of my power. I was just a regular medical student; in fact I wasn’t doing too well in class. I was practically flunking out of pathology. But I gradually started to change—I suddenly had all this energy—I didn’t even need to sleep any more. Along with this, my mental powers increased to the point that it became clear—I discovered the cure for all cancers. Can’t you see the irony doc? I’m flunking out of pathology, but I know more than any of them!

Physical exam is unremarkable, laboratory tests are in the normal range, and a urine drug screen finds no detectable substances. On mental status exam the patient is very animated, talking rapidly. He can be interrupted or redirected only with great difficulty and otherwise talks continuously. He quickly jumps from one subject to another, often with little or no connectedness. His affect is labile—at times he appears euphoric, but then can become quickly tearful. On cognitive exam, the patient needs a great deal of encouragement, but scores in the normal range on the Mini Mental Status Exam.

55. On the general portion of the mental status exam, which of the following best describes the patient’s manner of speech?

A. Flattened  
B. Labile  
C. Pressured  
D. Psychotic  
E. Emotive

56. Considering the patient’s process of thought, how could his thought process be best described?

A. Tangential  
B. Delusional  
C. Labile  
D. Pressured  
E. Blocked
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