26.E: Nervous System Infections (Exercises)

26.1: Anatomy of the Nervous System

Multiple Choice

What is the outermost membrane surrounding the brain called?

A. pia mater  
B. arachnoid mater  
C. dura mater  
D. alma mater

C

What term refers to an inflammation of brain tissues?

A. encephalitis  
B. meningitis  
C. sinusitis  
D. meningoencephalitis
A

Nerve cells form long projections called ________.  

A. soma
B. axons
C. dendrites
D. synapses

B

Chemicals called ________ are stored in neurons and released when the cell is stimulated by a signal.  

A. toxins
B. cytokines
C. chemokines
D. neurotransmitters

D

The central nervous system is made up of  

A. sensory organs and muscles.
B. the brain and muscles.
C. the sensory organs and spinal cord.
D. the brain and spinal column.

D

Matching

Match each strategy for microbial invasion of the CNS with its description.

_ intercellular entry  
A. pathogen gains entry by infecting peripheral white blood cells

_ transcellular entry  
B. pathogen bypasses the blood-brain barrier by travel along the olfactory or trigeminal cranial nerves

_ leukocyte-facilitated entry  
C. pathogen passes through the cells of the blood-brain barrier
D, C, A, B

**Fill in the Blank**

The cell body of a neuron is called the ________.

soma

A signal is transmitted down the ________ of a nerve cell.

axon

The ________ is filled with cerebrospinal fluid.

subarachnoid space

The ________ ________ prevents access of microbes in the blood from gaining access to the central nervous system.

blood-brain barrier

The ________ are a set of membranes that cover and protect the brain.

meninges

**Short Answer**

Briefly describe the defenses of the brain against trauma and infection.

Describe how the blood-brain barrier is formed.
Identify the type of cell shown, as well as the following structures: axon, dendrite, myelin sheath, soma, and synapse.

Critical Thinking

What important function does the blood-brain barrier serve? How might this barrier be problematic at times?

26.2: Bacterial Diseases of the Nervous System

Multiple Choice

Which of the following organisms causes epidemic meningitis cases at college campuses?

A. *Haemophilus influenzae* type b  
B. *Neisseria meningitidis*  
C. *Streptococcus pneumoniae*  
D. *Listeria monocytogenes*

B

Which of the following is the most common cause of neonatal meningitis?

A. *Haemophilus influenzae* b  
B. *Streptococcus agalactiae*  
C. *Neisseria meningitidis*  
D. *Streptococcus pneumoniae*
B

What sign/symptom would NOT be associated with infant botulism?

A. difficulty suckling
B. limp body
C. stiff neck
D. weak cry

C

Which of the following can NOT be prevented with a vaccine?

A. tetanus
B. pneumococcal meningitis
C. meningococcal meningitis
D. listeriosis

D

How is leprosy primarily transmitted from person to person?

A. contaminated toilet seats
B. shaking hands
C. blowing nose
D. sexual intercourse

C

Fill in the Blank

The form of meningitis that can cause epidemics is caused by the pathogen ________.

Neisseria meningitidis

The symptoms of tetanus are caused by the neurotoxin ________.
tetanospasmin

________ is another name for leprosy.

Hansen’s disease

Botulism prevents the release of the neurotransmitter ________.

acetylcholine

________ is a neurological disease that can be prevented with the DTaP vaccine.

Tetanus

Tetanus patients exhibit ________ when muscle spasms causes them to arch their backs.

opisthotonos

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**Short Answer**

A physician suspects the lesion and pustule pictured here are indicative of tuberculoid leprosy. If the diagnosis is correct, what microorganism would be found in a skin biopsy?

(credit: Centers for Disease Control and Prevention)
Critical Thinking

Explain how tetanospasmin functions to cause disease.

The most common causes of bacterial meningitis can be the result of infection by three very different bacteria. Which bacteria are they and how are these microbes similar to each other?

Explain how infant botulism is different than foodborne botulism.

26.3: Acellular Pathogenic Diseases of the Nervous System

Multiple Choice

Which of these diseases can be prevented with a vaccine for humans?

A. eastern equine encephalitis
B. western equine encephalitis
C. West Nile encephalitis
D. Japanese encephalitis

D

Which of these diseases does NOT require the introduction of foreign nucleic acid?

A. kuru
B. polio
C. rabies
D. St. Louis encephalitis

A

Which of these is true of the Sabin but NOT the Salk polio vaccine?

A. requires four injections
B. currently administered in the United States
C. mimics the normal route of infection
D. is an inactivated vaccine


Which of the following animals is NOT a typical reservoir for the spread of rabies?

A. dog  
B. bat  
C. skunk  
D. chicken  

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Fill in the Blank

The rogue form of the prion protein is called ________.

PrPSc

_______ are the most common reservoir for the rabies virus worldwide.

Dogs

_______ was the scientist who developed the inactivated polio vaccine.

Jonas Salk

_______ is a prion disease of deer and elk.

Chronic wasting disease

The rogue form of prion protein exists primarily in the ________ conformation.

beta sheet
Short Answer

Explain how a person could contract variant Creutzfeldt-Jakob disease by consuming products from a cow with bovine spongiform encephalopathy (mad cow disease).

Critical Thinking

If the Sabin vaccine is being used to eliminate polio worldwide, explain why a country with a near zero infection rate would opt to use the Salk vaccine but not the Sabin vaccine?

26.4: Neuromycoses and Parasitic Diseases of the Nervous System

Multiple Choice

Which of these diseases results in meningitis caused by an encapsulated yeast?

A. cryptococcosis
B. histoplasmosis
C. candidiasis
D. coccidiomycosis

A

What kind of stain is most commonly used to visualize the capsule of cryptococcus?

A. Gram stain
B. simple stain
C. negative stain
D. fluorescent stain

C

Which of the following is the causative agent of East African trypanosomiasis?

A. Trypanosoma cruzi
B. Trypanosoma vivax
C. Trypanosoma brucei rhodanese
D. Trypanosoma brucei gambiense
C

Which of the following is the causative agent of primary amoebic meningoencephalitis?

- A. *Naegleria fowleri*
- B. *Entameba histolyticum*
- C. *Amoeba proteus*
- D. *Acanthamoeba polyphaga*

A

What is the biological vector for African sleeping sickness?

- A. mosquito
- B. tsetse fly
- C. deer tick
- D. sand fly

B

How do humans usually contract neurocysticercosis?

- A. the bite of an infected arthropod
- B. exposure to contaminated cat feces
- C. swimming in contaminated water
- D. ingestion of undercooked pork

D

Which of these is the most important cause of adult onset epilepsy?

- A. neurocysticercosis
- B. neurotoxoplasmosis
- C. primary amoebic meningoencephalitis
- D. African trypanosomiasis

A
Fill in the Blank

The ________ is the main virulence factor of *Cryptococcus neoformans*.

capsule

The drug of choice for fungal infections of the nervous system is ________.

Amphotericin B

The larval forms of a tapeworm are known as ________.

cysticerci

_______ sign appears as swollen lymph nodes at the back of the neck in early African trypanosomiasis.

Winterbottom’s

_______ African trypanosomiasis causes a chronic form of sleeping sickness.

West

The definitive host for *Toxoplasma gondii* is ________.

cats

Trypanosomes can evade the immune response through ________ variation.

antigenic
Short Answer

Why do nervous system infections by fungi require such long treatment times?

Briefly describe how humans are infected by *Naegleria fowleri*.

Briefly describe how humans can develop neurocysticercosis.

Critical Thinking

The graph shown tracks the body temperature of a patient infected with *Trypanosoma brucei*. How would you describe this pattern, and why does it occur?

![Temperature chart](credit: modification of work by Wellcome Images)

Fungal meningoencephalitis is often the ultimate cause of death for AIDS patients. What factors make these infections more problematic than those of bacterial origin?

Compare East African trypanosomiasis with West African trypanosomiasis.