Microbiology - Survey of Infectious Disease

Microbial Diseases of the Nervous System

The human nervous system

- The *central nervous system* (CNS) consists of the brain and spinal cord
- The *peripheral nervous system* connects the CNS to tissues and the environment
Agents of *Bacterial Meningitis*

- *Haemophilus influenzae*
  - Upper respiratory tract pathogen
  - Once an important agent of bacterial meningitis among young children
  - Now controlled by universal vaccination
- *Neisseria meningitidis*
  - Important agent of meningitis in young adults
  - Vaccine is available
- *Streptococcus pneumoniae*
  - Also the most important bacterial agent of pneumonia
  - Vaccine is available
- *Listeria monocytogenes*
  - Mainly a pathogen of the immunocompromised
  - Infection may be foodborne

Disease due to Microbial *Neurotoxins*

- **Tetanus**
  - Agent is *Clostridium tetani*
  - Toxin, *tetanospasmin*, blocks neurotransmission of signals for muscle relaxation, leading to spastic paralysis
  - Rare today, usually controlled by toxoid administration
- **Botulism**
  - Agent is *Clostridium botulinum*
  - Toxin, *botulinum toxin*, blocks acetylcholine release, leading to flaccid paralysis and respiratory failure
  - Except for *infant botulism*, the bacterium cannot survive in the body

*Hansen’s Disease*, leprosy, involves the peripheral nervous system

- Agent is *Mycobacterium leprae*, which grows slowly and has never been cultivated on artificial media
- Tissue damage, as with tuberculosis, is due to type IV hypersensitivity
- Despite its reputation, Hansen’s is not especially contagious
- Treatment requires long-term antibiotic administration
- Hansen’s may be eradicable…and speaking of eradicable…
Polio

- Before vaccination, a common gastrointestinal tract infection, rarely leading to paralysis
- Pathogenesis of the paralytic form results from destruction of motor neurons
- Worldwide eradication is underway

Rabies

- Very rare in humans
- Frightening disease, prevented by postexposure prophylaxis involving simultaneous vaccination and passive immunization
- Contributed to Louis Pasteur’s international fame

Predominant wildlife species affected by rabies in the United States. Several antigodically different strains of the virus are associated with different animals. This often results in tracing the possible origin of cases when it is otherwise unknown (as described in the box in this chapter).

Rabies cases in various wild and domestic animals in the U.S.A in 1988.

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**Arboviral Encephalites**

- Zoonotic infections transmitted by arthropod (mosquito) vectors
- Most frequently *Eastern Equine Encephalitis*
- *West Nile Virus* is part of this group
- Prominent seasonality

**African trypanosomiasis**

- Transmitted by the tsete fly
- Trypanosomes reside in the CNS, causing neurological symptoms
- Difficult to control by either drugs or vaccination
- Capable of *antigenic variation*