Microbiology of the pns

patients with PNS dysfunction complain of;

1)sensory disturbance, e.g. (-) numbness, loss of sensation, (+) tingling, burning or both.

2) motor weakness, e.g. A loss of muscle mass, painful cramps, or fasciculations.

3)Autonomic disturbance

4)mixture od all (Motor , sensory, and autonomic)

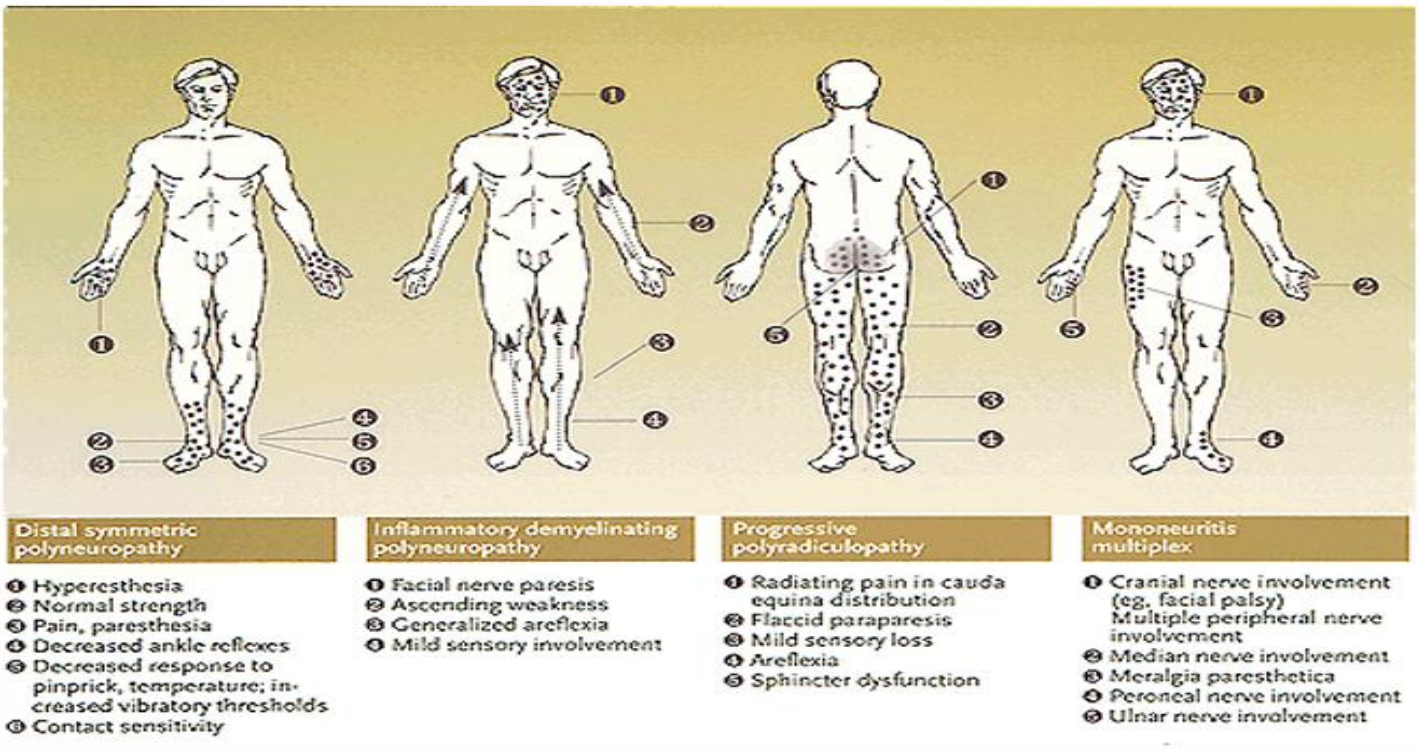
Notes: 1)Infectious causes are rare compared to vascular and primary inflammatory or autoimmune causes in PNS diseases and are usually underrecognized but potentially treatable.

2) examples of infectious diseases causes in the pns : leprosy (m/c), Lyme disease and HIV

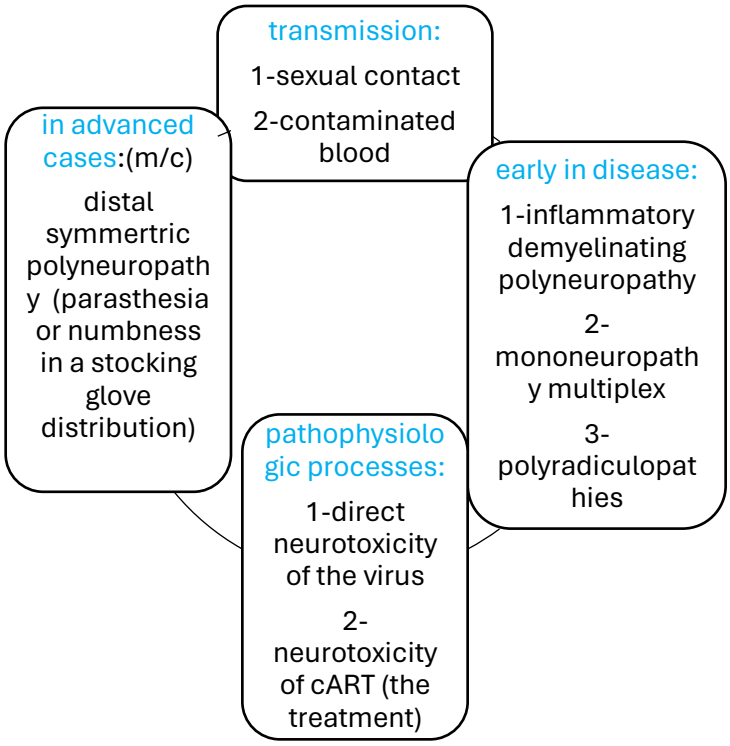
Pathogens that impact pns: (we'll mention them all this lec.)

Human immunodeficiency virus	Herpes virus	Polio virus	Borrelia burgdorferi
Clostridium tetani	Clostridium botulinum	Mycobacterium leprae	Campylobacter jejuni

Forms of pns dysfunction:



1-HIV



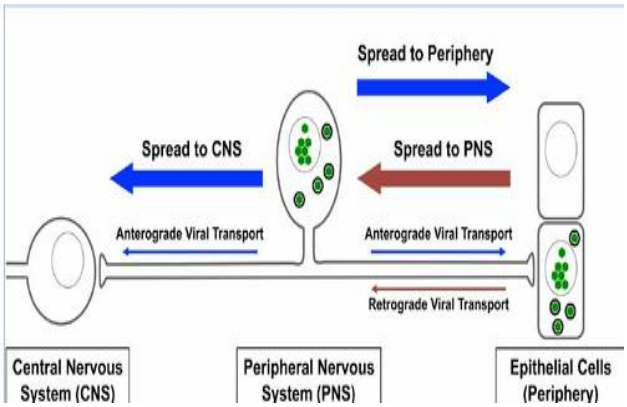
2-Herpes virus:

Herpes virus features:

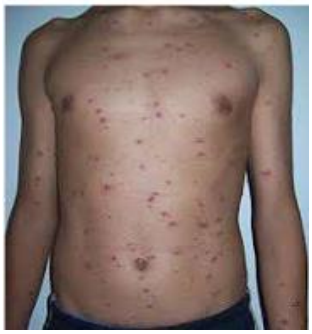
1- large, double-stranded, linear DNA genomes.
2- Latent, recurring infections

Virus	Subfamily	Disease	Site of Latency
Herpes Simplex Virus I	α	Orofacial lesions	Sensory Nerve Ganglia
Herpes Simplex Virus II	α	Genital lesions	Sensory Nerve Ganglia
Varicella Zoster Virus	α	Chicken Pox Recurs as Shingles	Sensory Nerve Ganglia

In their hosts, alpha herpesvirus infections typically initiate at peripheral sites, such as mucosal epithelia. Next, viral particles enter at the termini of sensory neurons of the peripheral nervous system (PNS). These particles are transported long distances along axons in the retrograde direction towards cell bodies, where the genomes are deposited in the nucleus to establish lifelong latency. Following reactivation from latency, new viral particles are assembled and transported towards sites of egress. Typically, infections spreads in the anterograde direction back out towards the periphery. This is essential for spread between hosts. Infection may also spread trans - neuronally, from the PNSto the central nervous system (CNS). Spread of alphaherpesvirusinfection into the CNS is associated with lethal encephalitis.



Varicella zoster virus (vzv)



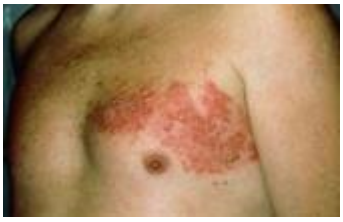
1-primary infection: in childhood. **Reactivation**: elderly or immunosuppressed

2-m/c complication: Post-herpetic neuralgia (PHN) :is a chronic neuropathic pain condition that persists 3 months or more following an outbreak of shingles

Treatment of phn:1) alpha-2 delta ligands (gabapentin and pregabalin)

2) anticonvulsants (carbamazepine)

3)tricyclic antidepressants (amitriptyline, nortriptyline, doxepin)



4)topical analgesics (5 % lidocaine patch, capsaicin)

5)Other opioids (ex. Tramadol)

3-types of pain it causes: a constant deep, aching, or burning pain; a paroxysmal, lancinating pain; hyperalgesia (painful stimuli are more painful than expected); and allodynia (pain associated with typically non-painful stimuli).

4- treatment of VZV: antiviral agents such as **acyclovir**, valacyclovir, and famciclovir for 7 days.

3-polio virus

Notes:1) Up to 72% of all polio infections in children are asymptomatic

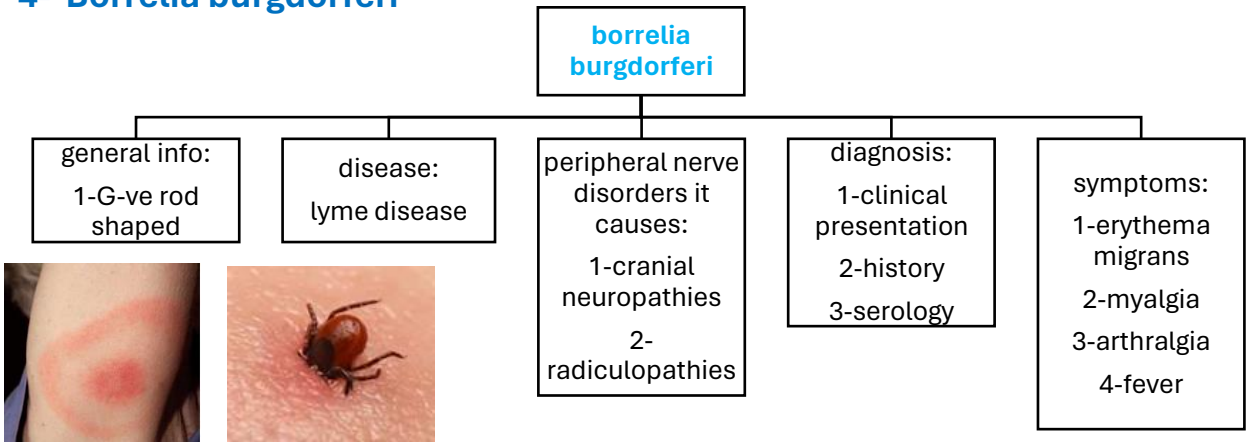
2)its rare now because of vaccines

3) Fewer than 1% of all polio infections in children result in flaccid paralysis

Diagnosis: 1)viral recovery from stool

2) rising antibody titre in blood.

4- Borrelia burgdorferi



5- Clostridium tetani

<table>
<tr>
<td>General information:

1-C. tetani is a spore-forming, anaerobic, Gram positive rod that causes tetanus.

2-Disease is relatively rare because of the high incidence of vaccine-induced immunity

3-it can be fatal due to respiratory muscle spasm</td>
<td>Diagnosis

physical examination
immunization history
clinical presentation</td>
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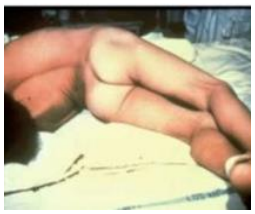
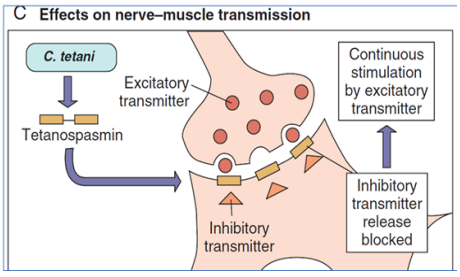
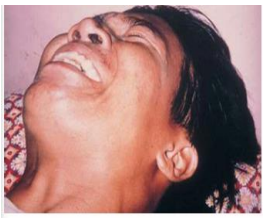
<td>Most common feature (characteristics)

1)Tetanospasmin: inactivates proteins that regulate release of the inhibitory neurotransmitters glycine and gamma-aminobutyric acid (GABA). This leads to
 
 

unregulated excitatory synaptic activity in the motor neurons, resulting in spastic paralysis.
2)sardonic smile: results from the sustained contraction of the facial muscles. (masseter muscles (lockjaw))
  </td>
<td>Treatment:

1-Admission to the ICU : mechanical ventilation and monitoring vitals

2-human tetanus immune globulin should be given

3-. Antimicrobial therapy is typically metronidazole (plays a minor role)

Note: penicillin G as an option for second-line therapy with a treatment duration of 1 week to 10 days.

Our primary focus in treatment is wound debridement and toxin mitigation</td>
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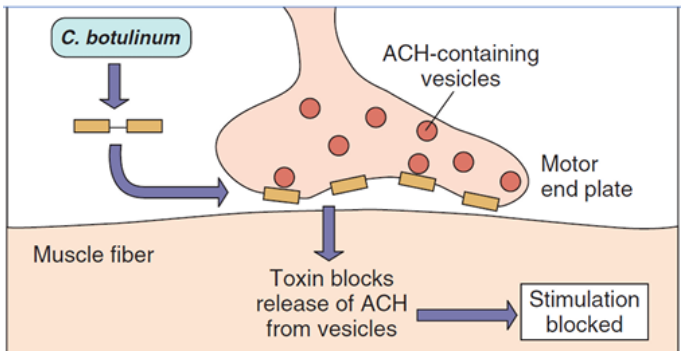
6- Clostridium botulinum

1-Types:

Foodborne botulism	Infant botulism
1-caused by canned foods 2-patient becomes dizzy and weak after 1 to3 weeks of consumption 3-Bilateral descending weakness of the peripheral muscles develops in patients with progressive disease (flaccid paralysis) 4-death is most commonly attributed to respiratory paralysis	1-foods (e.g., honey, infant milk powder) contaminated with botulinum spores and ingestion of spore-contaminated soil and dust 2- caused by neurotoxin produced in vivo by C. botulinum colonizing the GI tracts of infants.

2-Mechanism (imp): The botulinum neurotoxin remains at the neuromuscular junction, The botulinum endopeptidase then inactivates the proteins that regulate release of acetylcholine, blocking neurotransmission at peripheral cholinergic synapses. The resulting clinical presentation of botulism is a flaccid paralysis.



3-signs and symptoms:

1-diplopia (double vision) 2-blurred vision 3-ptosis(drooping eyelids

4-slurred speech 5-dysphagia 6-dry mouth 7-muscle weakness

4-diagnosis:

1-clinical symptoms

2-history

3-Laboratory confirmation :by demonstrating the presence of botulinum toxin in serum, stool, or food, or by culturing C. botulinum from stool, or a wound

5-treatment:

1-supportive care

2-antitoxin (effectiveness of antitoxin in the treatment of inhaled C. botulinum has not been proven).

Note: to avoid infant botulism don't feed babies under 12 months honey cuz its linked to botulism

7-campylobacter jejuni

General information:

1-It's a common cause of bacterial gastroenteritis

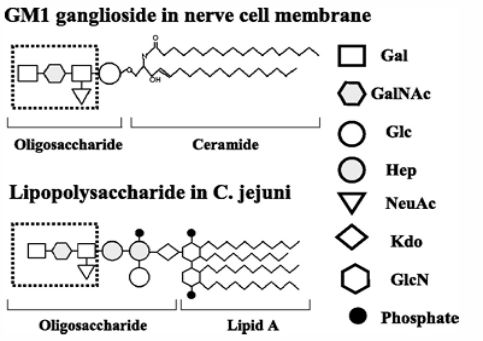
2-its a major triggering agent of Guillain-Barré syndrome (GBS).(is an immune-mediated demyelinating polyneuropathy of PNS characterized by acute or subacute symmetrical ascending motor weakness, areflexia, and mild-to-moderate sensory abnormalities)

3- most C. jejuni infections are self-limiting, occasionally a more invasive illness can occur that requires effective antimicrobial therapy.

Note:shigella ,salmonella and campylobacter species can also cause gastroenteritis

Mechanism:

Molecular mimicry between sialylated lipooligosaccharide structures on the cell envelope of these bacteria and ganglioside epitopes on the human nerves that generates cross-reactive immune response results in autoimmune-driven nerve damage.



Identification:

1-growth under selective conditions (microaerophilic)

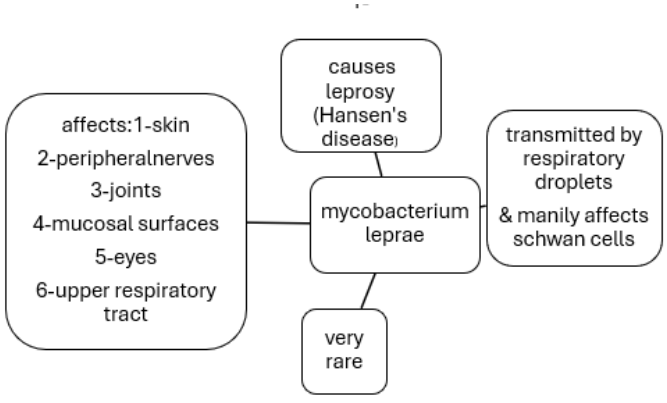
2-typical microscopic morphology (curved, gram negative rods)

Treatment:

1-monitoring respiratory muscles in the ICU and ventilator support

2- plasma exchange and intravenous immunoglobulin (IVIg)

8- Mycobacterium leprae



Notes: Symptoms mainly affect the skin, nerves, and mucous membranes (e.g one or a few hypopigmented or hyperpigmented skin macules that exhibit loss of sensation (anesthesia) due to infection of the peripheral nerves supplying the region.

It is morphologically indistinguishable from M. tuberculosis. The diagnosis is confirmed by skin or nerve biopsy and acid fast staining

e is treated with multidrug therapy (MDT)