

ENCEPHALITIS

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Virology	Togaviridae, alpha V Flaviviridae Bunya viridae					
	Eastern Equine (EEE); Western Equine (WEE); Venezuelan Equine (VEE); Ross Valley Fever (RVF); Chikungunya; Saint Louis (SLE); West Nile (WNE); Murray Valley (MVF); Japanese (JE); Powassan (POW) California (CE); Lacrosse (LAC); Jamestown Canyon (JCE)					
Epidemiology USA	EEE	WEE	SLE	WNE	LAC	POW
Natural host	Passerine: Pheasant Emu+++ Migratory birds	Passerine Birds	Birds	Wild Birds, many spp	Small mammals: Chipmunks, squirrels	Small mammals:
Vector in basic cycle	<i>Culiseta melanura</i>	<i>Culex melanura</i>	<i>Culex pipiens, tarsalis</i> <i>C. quinquefasciatus</i>	<i>Culex</i> spp + <i>Aedes, Anopheles</i>	<i>Aedes triseriatus,</i>	Ticks: <i>Ixodes cookei</i>
Vector breeding	Swamp water	Irrigation waters	Peridomestic, polluted waters,		Tree hole, Artificial containers	
Biting habit					Daytime-biting	
Habitat	Fresh water swamp Saltwater sw	Crop irrigation Stream drainage	Rural, town outskirts	Rural Urban outbreaks	Forest deciduous	
Other dead end hosts	Horse outbreaks	Horse outbreaks				
From basic to dead end	<i>Aedes, Coquillettidia</i>	<i>Culex tarsalis</i> <i>Ae. dorsalis</i>	Same <i>Culex</i>	<i>Culex pipiens,</i> <i>Aedes vexans</i>	<i>Culex pipiens</i>	
Epi pattern	Sporadic, Small outbreak	Sporadic	Sporadic, Small outbreak	Sporadic Outbreaks	Sporadic	Sporadic
Timing	Late summer, Early fall	Summer, Early fall	Late summer, Early fall	Late summer	Summer, early fall	June-Sep
USA	10 / year	1-10 /10 years	200 /yr (5-2,000)	NY 1999: 62 case	50-150 /yr	1-2 /yr
Incubation	1-4 days	5-15 days	5-15 days	3-12 days	5-15 days	7-14 days
Clinical Data						
Prodrome	Non specific febrile illness: Headache, malaise, anorexia, vomiting, abdominal pain, low grade fever, chills					
Early neuro Σ me	Few hours to few days: Headache somnolence, mild cognitive & behavioral disturbances Pain or paresthasias in extremities (Rabies, polio)					
CNS	Headache, drowsiness, coma, seizures					
Meningeal irritation	Drowsiness, decreased mentation, stiff neck, Brudzinski sign, Kernig;					
Brain swelling	Headache, photophobia, altered mental status (confusion, coma), seizure, hypertension, bradycardia, abnormal reflexes					
Focal neurologic deficit	Hemiparesis, aphasia, visual field defect, gaze preference					
Cranial nerve deficit						
Complications	seizures, increased intracranial pressure, or inappropriate antidiuretic hormone secretion					
Clinical	EEE	WEE	SLE	WNE	LAC	POW
% Asymptomatic	80%	2%	99%	95%	90%	
Symptomatic	Flu like Acute severe Enc	Mild, meningeal Σ me	Fever then CNS		Mild brief fever	Fever+ Convulsions Severe enc
Rash				Roseola-like, children		
Case fatality rate	35%	3%	10%	1% - NY99: 7/62	0.5%	50%
Sequelae	30% Permanent	Mostly children 20%	10%	None	1% resolve in yrs	50% Permanent
History/Risk factors	EEE	WEE	SLE	WNE	LAC	POWs
Age			Young, elderlies		95% \leq 18 yrs	
High risk		Rural resident	Low income areas Outdoor work or recreation		Foresters, hikers	Forest, trapper construction workers farmer
	Immuno suppressed (VZV)					
Pathology	1-Direct neuron invasion; 2-Vascular & parnchymal damage from inflammatory response: 3-Edema, compression, altered blood flow Chromatolysis of neurons, necrosis, neuronophagia, microglial proliferation, perivascular inflammation					
Lab tests	Bacteremia & Sepsis; Brain abscess; Seizures; Encephalitis					
CSF	Increased pressure: Abn > 150 mmH2O; >450mm = acute brain swelling					
Cell count	Few (10) or at most 1,000; rarely up to 8,000; mostly lymphocytes; neutrophil predominance in early stages					
Glucose	Normal (compare with blood level in diabetics) or mildly depressed (80% of blood); EEE with occasional bacteriologic profile					
Protein	< 100-150mg /dL, up to 500; >1,000 in subarachnoid blockage					
Bacteriology	Gram stain negative; Culture negative; Phadebact: no antigens					
Virology	CSF viral cultures					
Other	Blood cultures negative					
EEG	Slowing of background rhythms; focal or diffuse epileptiform discharges; some focal abnormalities (40% CE children; 50% EEE) Deep depression of background activity in severe cases					
MRI	Abnormalities in HSV encephalitis: focal temporal lobe edema, effacement of temporal lobe adjacent cisterns; 40% normal in HSV Any encephalitis: focal or generalized cerebral edema; effacement of the basal cisterns, or nonspecific T2 prolongation ADEM (acute disseminated encephalomyelitis) post infectious multifocal T2 prolongation within white matter suggests					
Serology	Single sample of serum or CSF for IgM: CE, EEE, WEE, SLE, JE Rise in IgM antibody over paired sera collected at 6 weeks interval: Hemagglutination inhibition; Most patients with rabies have detectable serum antibodies by day 15 of their illness.					

Virology	CSF, throat washings, or stool for enteroviruses; urine & saliva for CMV; CSF, blood, throat washings, rectal swab, urine, fluid from skin lesions, CNS tissues obtained by biopsy or autopsy for unknown
PCR	PCR used to detect in CSF: DNA from HSV, CMV, VZV, EBV, JE virus, RNA from rabies virus, HIV, enteroviruses
Differential	Seizures; Brain abscess, subdural empyema: Focal lesions, high cell count (>50,000) Bacteremia & Sepsis, endocarditis with embolic infarction in brain Rabies ADEM (acute disseminated encephalomyelitis) or post infectious encephalomyelopathy: measles, mumps, varicella; Viral Sore (influenza) Post vaccinal reactions: rabies (Semple type vaccine), smallpox Cerebral malaria; trichinosis; cysticercosis; toxocariasis; trypanosomiasis Carcinomatous meningitis, meningeal leukemia
Etiology: Viral	Enteroviruses: CoxsackieA (2,3,4,7,9,10), B (1-6: US 33%), ECHO (US 50%), polio Lymphocytic chorio meningitis (LCM), Cytomegalovirus (CMV), Mumps Herpes simplex, herpes zoster, adenovirus Arbor virus: see above
Treatment	HSV neonatal Acyclovir 10-20mg/kg q8 hours for 14 to 21 days HSV child /adult Acyclovir 10-15mg/kg q8 hours for 10 to 14 days VZV Same as HSV CMV Ganciclovir 5-6mg/kg twice daily for 14 to 21 days Seizures treated with lorazepam, phenytoin, or phenobarbital or IV barbiturate Increased intracranial pressure: hyperventilation, mannitol or other osmotic diuretics, fluid & electrolyte balance management Role of corticosteroids in patients controversial

