

Status: Arbovirus

SALS Level: 2

Antigenic Group: Colorado Tick Fever

Taxonomic status: *Orbivirus*

Other Information: None.

Select Agent:

SALS Basis: S

HEPA Filtration:

Section I - Full Virus Name and Prototype Number**Full Virus Name:** Prototype Number:

Colorado tick fever

Information from: Carl M. Eklund, M.D.

* Date: 2/1/1985

Address: Rocky Mountain Laboratory, Hamilton, Montana

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Reviewed by editor

Section II - Original Source**Isolated by:** Lloyd Florio, M.D. (1) **at:** Colorado Med. School, Denver, Colorado**Genus and species:** Man **Sentinel X****Age/Stage:** Sex: M

Isolated From	Isolation detail

Signs and symptoms of illness: Headache, backache, muscle, joint pains, anorexia, deep ocular pain, photophobia**Arthropod engorged** depleted gravid**Time held alive before inoculation:****Collection date:** 1/1/1943 **Method:** Venipuncture**Place collected:** Univ. of Colorado Med. School Hospital, Denver, CO**Latitude:** 40° " N **Longitude:** 105° " W**Macrohabitat:****Microhabitat:****Method of storage until inoculated:** Frozen in ice compartment of refrigerator**Footnotes:****Section III - Method of Isolation and Validity****Inoculation Date:** 1/1/1943**Animal:** Hamsters **Embryonated egg:** Tissue Culture:

(Details in Section VI - Biologic Char.)

Route inoculated: Intraperitoneal **Reisolation:** Not tried**Other reasons:** Hamster material produced disease in human volunteers.**Homologous antibody formation by source animal (See Section II):** Not tested**Test used:** HI CF NT**Other:****Footnotes:**

Section IV - Virus Properties

Physicochemical:

RNA: X DNA: Single Strand: Double Strand: X
Pieces: 12 (24) Infectivity: Sedimentation coefficient(s): /strong>
Percentage wt. of virion protein , lipid carbohydrate
Virion polypeptides:
Number: Details:
Non-virion polypeptides:
Number: Details:
Virion density: Sedimentation coefficient:
Nucleocapsid density Sedimentation coefficient:

Stability of infectivity (effects) pH Labile at pH 3.0 (20)

Lipid solvent:
(ether) After treatment titer Control titer
(chloroform) After treatment titer Control titer
Detergent:
(deoxycholate) After treatment titer Control titer
Other (formalin, radiation): Relatively resistant to lipid solvents and sodium deoxycholate(20)

Virion morphology:

Shape Orbivirus morphology Dimensions 80 nm
Mean (nm) range (nm) how measured Gradacol membrane; electron microscopy (16,17)
Surface projections, envelope No envelope; occasionally pseudoenvelopes
Nucleocapsid dimensions, symmetry Round-shaped capsid; diameter = 50 nm

Morphogenesis:

Site of constituent formation in cell
Site of virion assembly
Inclusion bodies
Other

Hemagglutination:

Hemagglutination No Antigen source SMB and serum ext. by acetone-ether
Erthrocytes Chick pH range pH optimum
Temperature optimum range
Remarks
Serologic methods recommended CF and NT
Footnotes:

Section V - Antigenic Relationship And Lack of Relationship To Other Viruses

In complement-fixation tests with Groups A, B, and California antigens, results were negative with CTF antisera.

Group A, B, California, Bunyamwera (Cache Valley), Quaranfil and Chenuda virus antisera gave negative results when tested by complement-fixation against Colorado tick fever virus antigen.

By CF and NT, CTF is closely related to Eyach virus (see Eyach virus registration). Together, these two viruses comprise the CTF serogroup.

Section VI - Biologic Characteristics

Virus source (all VERTEBRATE isolates): Blood (M)(LV)

Lab Methods of Virus Recovery (ALL ISOLATIONS): Newborn mice and hamsters; human; hamster and mouse cell lines; primary chick embryo cell cultures

Susceptibility of Cell Culture Systems:

Cell system (a)	Virus passage history (b)	Evidence of Infection							
		CPE		PLAQUES		Growth Without CPE			
		Day (c)	Extent (d)	Titer TCD50/ml (e)	Day (c)	Size (f)	Titer PFU/ml (e)	+/- (g)	
KB (CL)	Isol. fr. ticks and blood clot	3-5	CPE	4.0-5.0*					
Vero (CL)	P-6				9	1 mm	5.7* (26)		
LLC-MK2 (CL)						No plaques (26)			
BHK-21 (CL)		6	3+	5.7 (27)					

* Expressed in dex

Section VII - Natural Host Range

Vertebrate (species and organ) and arthropod	No. isolations/No. tested	No. with antibody/No. tested Test used	Country and region
Golden mantled ground squirrel	56/131	1/28 NT	Northwestern U.S., and western Canada
Columbian ground squirrel	35/264	0/110 NT	(represents experience at RML)
Chipmunks	15/70	0/1 NT	
Pine squirrels	1/4		
Deer mice	1/6		
Porcupine	1/2	1/9 NT	
Dermacentor andersoni	716/36,808		
Dermacentor occidentalis	3/2,291		
Dermacentor parumapertus	3/1,915		
Dermacentor albopictus	1/1,768		
Otobius lagophilus	1/28 nymphs		
Otobius lagophilus	0/175 larvae		
Otobius lagophilus	0/3 adults		
Man (blood) *	Numerous		Northwestern USA
Lepus californicus	1	31IFA,PRNT	Medocino Cty, CA (24)
Deer (Odocoileus hemionus)		21 PRNT	
Sheep (Ovis aries)		1	
Coyotes (Canis latrans)		2 PRNT	
Ground squirrels (Spermophilus beecheyi)		3 PRNT	
CA meadow mice (Microtus californicus)		2 PRNT	
Wood rats (Neotoma fuscipes)		2 PRNT	
Deer mouse (Peromyscus maniculatus)		1 PRNT	

* Virus in red blood cells of man up to 110 days after onset (18)

Section VIII - Susceptibility To Experimental Infection (Record Viremia)

Experimental host and age	Passage history and strain	Inoculation Route-Dose	Evidence of infection	AST (days)	Titer log10/ml
Mice (nb)	Recently isol.	ic 0.02	Death	6-9	5-7.5
Mice (nb)	tick or human	ip 0.05	Death	6-9	5-7.5
Mice (nb)		sc			
Mice (wn)	Florio-mouse adapt	ic 0.03	Death	3-6	7.0
Mice (wn)		ip			
chick embryo(7 day)		ys 0.25	Titration in mice *		4.5
hamster(ad)	Recent isolate	sc 0.05	Viremia 24-96 hours		3.0
chicks(1 day)	Recent isolate	sc 0.05	Viremia 24-96 hours		3.0
rhesus monkey (5 lb)	Florio	sc 1.0	Viremia 1-128 days		3.8
		im			
		iv			
porcupine (ad)	Tick strain	tick bite	Viremia to 45 days		5.0
Columbian gr. squirrel (ad)		"" ""	Viremia 15-20 days		1.7
Golden mantled ground squirrel(ad)		"" ""	Viremia 15-20 days		3.8
chipmunk (ad)		"" ""	Viremia 15-20 days		6.2
deer mice (ad)		"" ""	Viremia 15-20 days		3.0
man (ad)		sc 4.0	Typical clinical and blood picture (15,16)		

* Virus present in central nervous system only.

Section IX - Experimental Arthropod Infection And Transmission

Arthropod species & virus source(a)	Method of Infection log10/ml (b)		Incubation period (c)	Transmission by bite (d)		Assay of arthropod, log10/ml (e)		
	Feeding	Injected		Days	°C	Host	Ratio	Whole

Section X - Histopathology

Character of lesions: Mice, hamsters, guinea pigs (5): necrosis in the brain and myocardium (3). Bone marrow - distinct maturation arrest in the granulocytic series (4).

Inclusion bodies:

Cytoplasmic: (M)

(LV)

Intranuclear: (M)

(LV)

Organs-tissues affected: Brain (LV), heart (LV), marrow (M)

Category of tropism:

Section XI - Human Disease

Human disease:

In nature:

(S) X

Death:

(S)

(R)

Residua:

(S)

(R)

Laboratory infections:

Subclinical:

(S)

(R)

Overt Disease:

(S) X

Clinical manifestations: Fever (S), headache (S), prostration (S), conjunctival inflammation (R), stiff neck (R), myalgia (S), CNS signs (including encephalitis)(R), hemorrhagic signs (R), leukopenia(S), CNS pleocytosis (R), rash (R), vomiting (R), pericarditis (20).

Category: Endemic disease

No. of cases: at least
200 to 300 cases

Section XII - Geographic Distribution

Known (virus):

Corresponds essentially with the distribution of *D. andersoni*. (Northwestern USA; Alberta, and British Columbia, Canada (21,22)

Suspected (antibody):

Because of ease of isolation of virus from patients and ticks, geographical distribution has been determined by actual virus isolation.

Section XIII - References

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Section XIV - Remarks