

Virus Name: Vesicular Stomatitis, Indiana serotype		Abbreviation: VSIV
Status Arbovirus	Select Agent No	SALS Level 2
SALS Basis Extensive laboratory experience and mild nature of aerosol laboratory infections justifies Level 2.		
Other Information		
Antigenic Group Vesicular Stomatitis		

SECTION I - Full Virus Name and Prototype Number

Prototype Strain Number / Designation Lab strain	Accession Number	Original Date Submitted 7/12/1984
Family Vesiculovirus	Genus	
Information From Robert B. Tesh	Address Yale Arbovirus Research Unit, New Haven, CT 06510	
Information Footnote Revised		

Section II - Original Source

Isolated By (name) W.E. Cotton (1)	Isolated at Institute Bureau of Animal Industry, Bethesda, MD	
Host Genus Cow	Species	Host Age/Stage Immature
Sex Female		
<u>Isolated From</u>	<u>Isolation Details</u>	
Organs/Tissues	tongue ephelium	
Signs and Symptoms of Illness salivation, inappetence, vesicles on lips and tongue, lameness (1)	Arthropod	
Time Held Alive before Inoculation		
Collection Method	Collection Date 7/1/1925	
Place Collected (Minimum of City, State, Country) Indiana: from calf shipped from Kansas City (1)		
Latitude 40° 0' N	Longitude 90° 0' W	
Macrohabitat	Microhabitat	Method of Storage until Inoculated buffered glycerine
Footnotes		

Section III - Method of Isolation

Inoculation Date
7/1/1925

Animal (Details will be in Section 6)
gp

Route Inoculated
foot pad

Reisolation

Other Reasons
unknown if reisolation attempted

Homologous Antibody Formation by Source Animal
Not tested

Test(s) Used

Footnotes

Section IV - Virus Properties

Physicochemical
RNA, Single Strand

Pieces (number of genome segments) 1	Infectivity no	Sedimentation Coefficients(s) 38-45(S)
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Percentage wt. of Virion Protein 60-70%	Lipid 20-25%	Carbohydrate 3-13% (2); RNA 0.7-5
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Virion Polypeptides: Number 5	Details M (MW: 150-200 x 10³), G (MW: 66 x 10³), N (MW: 54 x 10³), M (MW: 27 x 10³), NS (MW: 29-45 x 10³) (2)
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Non-virion Polypeptides: Number 0	Details
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Virion Density 1.18 - 1.20 in sucrose	Sedimentation Coefficients(s) 625 S (2)(S)
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Nucleocapsid Density 1.32 in CsCl	Sedimentation Coefficients(s) 140 S(S)
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Stability of Infectivity (effects)

pH (infective range)
unstable at pH 3; stable at pH 5-10 (3)

Lipid Solvent (ether - % used to test) sensitive	After Treatment Titer	Control Titer
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Lipid Solvent (chloroform) sensitive	After Treatment Titer	Control Titer
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Lipid Solvent (deoxycholate)	After Treatment Titer	Control Titer
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Other (formalin, radiation)
inactivated rapidly

Virion Morphology

Shape bullet-shaped	Dimensions 180 x 75 nm
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Mean nm	Range nm
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Measurement Method
electron microscopy

Surface Projections/Envelope
surface projections (6-10 nm); bilayer lipid membrane (2)

Nucleocapsid Dimensions, Symmetry
extended 3.5 nm, helical 30-35 turns, 49 nm outer, 29 nm diameter (2)

Morphogenesis

Site of Constituent Formation in Cell
cytoplasm

Site of Virion Assembly
buds from plasma membrane (3)

Site of Virion Accumulation
extracellular and in cytoplasmic vesicles

Inclusion Bodies
not usually

Other

Hemagglutination

Hemagglutination
Yes

Antigen Source
infected BHK-21 cell cultures (4, 5)

Erythrocytes (species used)
goose

pH Range

pH Optimum
5.8

Temperature Range
0 - 37dC

Temperature Optimum
ice water

Remarks

see reference 5 for optimal conditions for preparing hemagglutinin

Serologic Methods Recommended
CF, NT

Footnotes

see reference 5 for optimal conditions for preparing hemagglutinin

CF tests (2):

Antigens	VS-New Jersey	VS-Indiana	Cocal	Piry	Chandipura
VS-New Jersey	256/512 *	0	0	0	0
VS-Indiana	0	256/512	32/128	0	0
Cocal	0	32/512	256/512	0	0
Piry	0	0	0	128/32	8/4
Chandipura	0	0	0	0	128/64

* Titer of serum/titer of antigen; 0 = <4/4

Plaque reduction neutralization tests (6):

Immune serum	Virus					
	VS-New Jersey	VS-Indiana	Cocal	Piry	Chandipura	Isfahan
VS-New Jersey	10240 **	<10	<10	<10	<10	<10
VS-Indiana	<10	327680	320	<10	<10	<10
Cocal	<10	160	5120	<10	<10	<10
Alagoas	<10	20	20	<10	<10	<10
Piry	<10	<10	<10	163840	80	<10
Chandipura	<10	<10	<10	<10	10240	<10
Isfahan	<10	<10	40	<10	<10	163840

** Reciprocal of highest serum dilution giving $\geq 95\%$ plaque inhibition

For additional CF or NT data see Vesicular Stomatitis Alagoas registration card and Reference [32].

No cross reactions demonstrated by CF or NT between VSI and Flanders, Hart Park, Mokola, rabies, Lagos bat, Mt. Elgon bat, Kern County or Klamath viruses [2].

The recently described Perinet virus, a rhabdovirus from mosquitoes in Madagascar, was shown to be serologically related to some members of VSV serogroup [34].

Virus Source (all VERTEBRATE isolates)

Lab Methods of Virus Recovery (ALL ISOLATIONS)
Newborn mice

Cell system (a)	Virus passage history (b)	Evidence of Infection							Growth Without CPE +/- (g)
		CPE			PLAQUES				
		Day (c)	Extent (d)	Titer TCD50/ml (e)	Day (c)	Size (f)	Titer PFU/ml (e)		
Vero (CL)	Vero 3	2	4+		3	3-4 mm	8.5 ^a		

VS-Indiana produces CPE and plaques in a wide variety of mammalian, avian and cold-blooded animal cell lines (7). It also grows in a number of arthropod cell lines without producing CPE (8, 9).

^a Expressed in dex

Vertebrate (species and organ) and arthropod	No. isolations/No. tested	No. with antibody/No. tested Test used	Country and region
man (blood; lab infections)	several		USA (10, 11)
cattle (buccal scrapings)	many		North, Central and South America
swine (buccal scrapings)	several		USA
horses (buccal scrapings)	several		USA;, Brazil
man (adult rural inhabitants)		209/1,160 NT	Guatemala (12)
man		144/670 NT	Honduras (12)
man		146/675 NT	El Salvador (12)
man		119/723 NT	Nicaragua (12)
man		141/975 NT	Costa Rica (12)
man		980/2,042 NT	Panama (11)
cattle		319/885 NT	
horses		346/611 NT	
swine		93/187 NT	
Lutzomyia sp.	5/14,945		Almirante, Panama (13, 14)
Lutzomyia trapidoi	3/52,415		Aguacate, Panama (15)
Lutzomyia sp.	6/105,757		
Aedes sp.	1/8,055		New Mexico, USA (16)

VS-Indiana neutralizing antibodies have been found in a wide variety of wild mammals in Panama, principally arboreal and semiarboreal species (17, 18).

Experimental host and age	Passage history and strain	Inoculation Route-Dose	Evidence of infection	AST (days)	Titer log ₁₀ /ml
mice (nb)		ic	encephalitis, death (19-21)	4-5	5.0
mice (nb)		ip	encephalitis, death (19-21)	4-5	5.0
mice (nb)		sc	encephalitis, death (19-21)		
mice (wn)		ic	encephalitis, death (19-21)		
mice (wn)		ip	survival, antibody prod. (19-21)		
hamster (nb)	MB 6	ip	death (23)	1-2	
guinea pig (wn)		intra-dermal	vesicles on foot pad and tongue (23)	2-3	
guinea pig (wn)		ic	death (23)	4-5	

wild mammals: many adult wild mammals develop inapparent infection and antibodies following subcutaneous inoculation (24).

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	Organ	System
Lutzomyia trapidoi	5.3		5	20	mice (nb)		3.9		plaques, vero (25)
Transovarial transmission of VS-Indiana was demonstrated in exp. infected Lutzomyia trapoi and L. ylephilator, but not in L. sanguinaria or L. gomezi (26).									
Aeces aegypti		1.0	4-10	26	mice (nb)		4.5		plaque assay (27, 28)
Multiplication following inoculation has also been demonstrated in Anopheles quadrimaculatus (29), Culex quinquefasciatus (29), Perigrinus maidis (30) and Drosophila melanogaster (31)									

Section X - Histopathology

Character of lesions (specify host)

vesicles on tongue, teats and feet (LV)

Inclusion Bodies

Intranuclear

Organs/Tissues Affected

(LV); intracerebral inoculation causes encephalitis; inoculation of tongue or feet may produce vesicular lesions. See reference 32 for discussion of experimental pathology

Category of tropism

(LV) epitheliotropic, neurotropic, viscerotropic (32)

Section XI - Human Disease

In Nature
Reported

Residual

Death

Subclinical

Overt Disease
Significant

Clinical Manifestations

fever, headache, prostration, conjunctival inflammation, arthralgia, and myalgia (10, 11)

Number of Cases

20-30 reported

Category (i.e. febrile illness, etc.)

febrile illness

Section XII - Geographic Distribution

Known (Virus detected)

most countries of North, Central and South America

Suspected (Antibody only detected)

Section XIII - References

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Remarks

Basic epizootic unit considered to be pasture rather than arthropods (35).