

Virus Name: Wesselsbron		Abbreviation: WSLV
Status Arbovirus	Select Agent No	SALS Level 3
SALS Basis Results of SALS surveys and information from the Catalogue.		
Other Information USDA Permit Required, Hepa Filtration, USDA Restricted		
Antigenic Group B		

SECTION I - Full Virus Name and Prototype Number

Prototype Strain Number / Designation van Tonder strain	Accession Number	Original Date Submitted 10/6/1984
Family Flaviviridae	Genus Flavivirus	
Information From B.M. McIntosh	Address National Institute for Virology, P/Bag X4, Sandringham, 2131, South Africa	
Information Footnote Revised		

Section II - Original Source

Isolated By (name) K.E. Weiss, et al (1)	Isolated at Institute Onderstepoort Vet. Res. Lab., Pretoria	
Host Genus Merino sheep	Species	Host Age/Stage 8 days-old
Sex Not Answered		
<u>Isolated From</u>	<u>Isolation Details</u>	
Organs/Tissues	Liver	
Signs and Symptoms of Illness Donor lamb died during outbreak of mortality in lambs and abortion in ewes	Arthropod	
Time Held Alive before Inoculation		
Collection Method	Collection Date 3/1/1955	
Place Collected (Minimum of City, State, Country) Wesselsbron, South Africa		
Latitude 28° S	Longitude 26° E	
Macrohabitat Temperate; grassland plateau ca. 4,000 feet above sea level	Microhabitat	Method of Storage until Inoculated Carcass posted to laboratory without refrigeration
Footnotes		

Section III - Method of Isolation

Inoculation Date		
Animal (Details will be in Section 6) nb mice		
Route Inoculated Intracerebral	Reisolation Not tried	
Other Reasons		
Homologous Antibody Formation by <u>Source Animal</u>		
Test(s) Used		
Footnotes		

Section IV - Virus Properties

Physicochemical		
Pieces (number of genome segments)	Infectivity	Sedimentation Coefficients(s) (S)
Percentage wt, of Virion Protein	Lipid	Carbohydrate
Virion Polypeptides: Number	Details	
Non-virion Polypeptides: Number	Details	
Virion Density	Sedimentation Coefficients(s) (S)	
Nucleocapsid Density	Sedimentation Coefficients(s) (S)	
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<u>Stability of Infectivity (effects)</u>		
pH (infective range)		
Lipid Solvent (ether - % used to test)	After Treatment Titer	Control Titer
Lipid Solvent (chloroform)	After Treatment Titer	Control Titer
Lipid Solvent (deoxycholate)	After Treatment Titer	Control Titer
Other (formalin, radiation)		
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<u>Virion Morphology</u>		
Shape	Dimensions 45 nm (2)	
Mean nm	Range nm	
Measurement Method Electron microscopy	Surface Projections/Envelope	Nucleocapsid Dimensions, Symmetry

Morphogenesis

Site of Constituent Formation in Cell	Site of Virion Assembly	Site of Virion Accumulation Cisternae of endoplasmic reticulum
Inclusion Bodies	Other	

Hemagglutination

Hemagglutination Yes	Antigen Source SMB ext. by sucrose-acetone	Erythrocytes (species used) Goose
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pH Range 6.0-7.0	pH Optimum 6.5
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Temperature Range	Temperature Optimum
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Remarks

Serologic Methods Recommended
HI, CF, NT

Footnotes

Antigens or Antibodies	WSL Antigen CF (3)	WSL Antibody CF (3)
Bagaza	8	32
Ntaya	32	16
West Nile	32	64
Usutu	32	32
Koutango	32	256
Banzi	64	16
Uganda S	64	128
Bouboui	32	32
Saboya	>128	64
Spondweni	256	128
Zika	32	256
Dengue 1	64	1024
Yellow fever	>128	64
Dakar bat	>64	>1024

Results expressed as ratio, homologous/heterologous titers.

In cross PRNT with 42 flaviviruses WSL gave a completely monospecific response [4]. Placed in the West Nile serological subgroup [5]. In a later study, 60 registered and 5 unregistered flaviviruses were tested against antibody to WSL virus in PRNT. The antibody did not cross-react with other flaviviruses, such that WSL virus could not be assigned to a given complex in group B [40].

Section VI - Biologic Characteristics

Virus Source (all VERTEBRATE isolates)
Blood (LV)

Lab Methods of Virus Recovery (ALL ISOLATIONS)
Primary duck embryo cell cultures NOTE: Original mosquito
suspensions nonpathogenic for suckling mice

Cell system (a)	Virus passage history (b)	Evidence of Infection						
		CPE			PLAQUES			Growth Without CPE +/- (g)
		Day (c)	Extent (d)	Titer TCD50/ml (e)	Day (c)	Size (f)	Titer PFU/ml (e)	
PS (CL)	MB 146				5		7.0* (6)	
Vero (CL)	MB 15				3	3 mm	9.2 (7)	
LLC-MK2 (CL)					5	7 mm	9.5 (7)	
LLC-MK2 (CL)					6	2-5 mm	8.1 (8)	
MA-104 (CL)					7	<1 mm	5.7 (8)	
PC-C1 (CL)					6	1-2 mm	8.7 (8)	
Vero (CL)					4	1 mm	5.8 (8)	
BHK-21 (CL)	MB 17	2	4+	6.5* (9)				

* 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)	7	507/4,293 NT	South Africa (1, 3, 10-13)
Man	1		Senegal (21)
Man		189/855 NT	Mozambique (14)
Man		54/492 NT	Angola (15)
Man		27/120 NT	Caprivi, Namibia (16)
Man		48/323 NT	Okavango, Botswana (16)
Man		95/2,551 HI	Zimbabwe (17)
Sheep	Many	23/114 NT	South Africa (1, 3, 18, 19)
Cattle	3	64/173 NT	South Africa(3, 19, 20)
Cattle	1	302/409 NT	Zimbabwe (20)
Desmodillus auricularis (rodent)	1		South Africa (3)
Camel	1		Nigeria (22)
Aedes caballus/juppi	13		South Africa (23)
Ae circumluteolus	12		South Africa (3, 24)
Ae lineatopennis	17		Zimbabwe (25)
Ae dentatus	1		Kenya (26)
Ae dalzieli	4		Senegal (27)
Ae tarsalis and 5 other species			Cameroun (28)
Ae abnormalis and 2 other species			Central African Republic (28)
Ae mediolineatus and Ae lineatopennis	4		Bang Phra, Thailand (29)

Experimental host and age	Passage history and strain	Inoculation Route-Dose	Evidence of infection	AST (days)	Titer log ₁₀ /ml
Mice (nb)	H 177	ic	Death	3-4	9.0
Mice (nb)		ip			
Mice (nb)		sc			
Mice (wn)		ic	Death	7-10	8.0
Mice (wn)		ip	Death occasionally		
hamster		sc	Viremia		
Desmodillus auricularis		sc	Viremia (3)		8.4
sheep (ad)			Fever, viremia, 20% mortality in pregnant ewes, hydrops amnii, foetal hydranencephaly and arthrogryposis (18,30,39)		7.2
lamb			Viremia, fever, mortality 29% (30)		8.0
cattle		Viremia (17) foetal infection with porencephaly, cerebellar hypoplasia, abortion (17,38)		7.2	

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
Ae caballus *	Wild caught females				sheep	6 mosq. fed 1 sheep; transmission occurred (31)			
Ae caballus *	Viremic sheep		21-22		mice	Lots of 6 and 3 mosq; both transmitted (31)			
Ae circumluteolus	X		6-67		mice	Lots of mosq. Transmitted 89 of 118 attempts (32)			
Ae aegypti	4.5		>14		mice	4/27; 13/62 mosq. Infected Titres 1.7-5.1 (33)			
Cx quinquefasciatus	4.5		>22		mice	4/28; 34/68 mosq. Infected Titers 1.7-4.4 (33)			
Ornithodoros savigney	5.5-8.0		>6	26	hamster	6 infected ticks failed to transmit; 11/50 ticks infected (34)			
Cx. zombaensis	8.4		20-30	26	hamster	1 lot of 6 transmitted day 20; 1 lot of 2 transmitted day 30; 13/26 mosq. infected(34)			

* Taxon "caballus" has since these experiments been split into two species, "caballus" and "juppi".

Section X - Histopathology

Character of lesions (specify host)

Sheep - liver shows fatty infiltration, bile pigmentation, necrosis of parenchymal cells, infiltration of lymphocytes and neutrophils (18,35)

Inclusion Bodies

Intranuclear

Organs/Tissues Affected

Hepatitis, hydrops amnii in pregnant sheep, hydranencephaly, arthrogryposis, hypoplasia of spinal cord and muscular atrophy in ovine foetuses (30)

Category of tropism

Hepatotropic, neurotropic

Section XI - Human Disease

In Nature Reported	Residual	Death
Subclinical	Overt Disease Reported	
Clinical Manifestations Fever (biphasic), headache, eye pain, body pains, anorexia, insomnia, hepatomegaly, splenomegaly, disturbances in speech, hearing, vision, rise in blood transaminases (11,36,37)		
Number of Cases 9	Category (i.e. febrile illness, etc.) Febrile illness	

Section XII - Geographic Distribution

Known (Virus detected) South Africa (1,24), Zimbabwe (20), Senegal (27), Nigeria (22), Kenya (26), Cameroon (28), Central African Republic (28), Thailand (29)
Suspected (Antibody only detected) Mozambique (14), Angola (15), Namibia (16), Botswana (16)

Section XIII - References

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Remarks

It seems that transmission cycles involving Aedes species and domestic angulates have a significant role in the ecology of WSL virus at the present time. Because of the low clinical response, especially in cattle, much of this transmission would be unrecognized. The source of human infection would be mosquito-borne as well as acquired contagiously from domestic angulates.