Virus Name: Quaranfil	Abbreviation: QRFV

Status
Arbovirus

Select Agent
No

SALS Level
2

SALS Basis
Results of SALS surveys and information from the Catalogue.

Other Information

Antigenic Group
Quaranfil

SECTION I - Full Virus Name and Prototype Number

Prototype Strain Number / Designation
Ar-1113

Accession Number

Original Date Submitted
1/3/1985

Family
Not listed

Genus
Not listed

Information From
R.M. Taylor

Address
School of Public Health, Warren Hall, University of California, Berkeley, California

Information Footnote
Reviewed by editor

Section II - Original Source

Isolated By (name)
R.M. Taylor, et al. (1)

Isolated at Institute
NAMRU-3, Cairo, Egypt

Host Genus
Argas (Persicargas) arboreus

Species

Host Age/Stage
Mostly nymphs

Sex
Not Answered

Isolated From

Isolation Details

Signs and Symptoms of Illness

Arthropod

Time Held Alive before Inoculation

Collection Method
By hand

Collection Date
12/8/1953

Place Collected (Minimum of City, State, Country)
Nile barrage, near Cairo, Egypt

Latitude
30° N

Longitude
32° E

Macrohabitat
Grove of trees; egret (Bubulcus ibis ibis) rookery

Microhabitat
Bark of tree

Method of Storage until Inoculated
Alive; at ambient temperature

Footnotes

Section III - Method of Isolation

Inoculation Date
12/10/1953

Animal (Details will be in Section 6)
nb mice

Route Inoculated
ic and sc

Reisolation
No

Other Reasons
New virus; repeated isolations from ticks, egrets, and pigeon squabs.

Homologous Antibody Formation by Source Animal

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)	

Stability of Infectivity (effects)

pH (infective range)

Lipid Solvent (ether - % used to test) **50%, 24 hours**	After Treatment Titer **<2.0 dex**	Control Titer **5.0 dex**
Lipid Solvent (chloroform)	After Treatment Titer	Control Titer
Lipid Solvent (deoxycholate) **1:1000**	After Treatment Titer **<2.0 dex**	Control Titer **5.0 dex**

Other (formalin, radiation)
Can be desiccated without material loss in titer.

Virion Morphology

Shape **Arenavirus-like (16)**	Dimensions **55+ nm ; 130-145 nm**	
Mean **140**nm	Range nm	
Measurement Method **Gradocol membrane filtration ; EM (16)**	Surface Projections/Envelope	Nucleocapsid Dimensions, Symmetry

Morphogenesis

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

Hemagglutination

Hemaggiutination	Antigen Source	Erythrocytes (species used)
No	**SMB ext. by acetone-ether**	**Goose**
pH Range **6.0-7.0**	pH Optimum	
Temperature Range	Temperature Optimum	

Remarks

Serologic Methods Recommended
CF, NT

Footnotes

Section V - Antigenic Relationship and Lack of Relationship to Other Viruses

Has been examined by CF and found unrelated to following viruses [2] : trivittatus-7941 (64). Anopheles A (64), Anopheles B (128), bat virus-Burns (128), Rio Bravo (128), Bunyamwera (64), Bwamba (32), Cache Valley (64), California (BFS-283)(32), chikungunya (256), Colorado tick fever (Florio)(64), dengue (Hawaii)(>8), dengue (NGB)(64), EEE (85)(128), herpes simplex (8), herpes simplex (E. Johnson) (32), Ilheus (256), Jap. enc. (Nakayama)(128), LCM (512), Mayaro (64), mouse virus-FA-660 (16), mouse virus-GD-7 (16), MVE (128), Ntaya (128), Powassan (128), RSSE (8), Sandfly fever-Sicilian (128), Semliki Forest (>512), Sindbis (128), St. Louis (Parton)(128), Turlock (64), Uganda S (128), WEE (85)(128), Wyeomyia (>512), YF-Jungle (256), YF (17D)(32), Zika (128). Cross tests were made with Quaranfil-Ar-1113 (128). The numbers in parentheses represent the reciprocal of the dilution of immune serum required to obtain complete complement-fixation with the homologous antigen. Though the prototype strains of Quaranfil (Ar-1113) and Chenuda (Ar-1170) and an Egyptian strain Ar-1304 used as prototype of Nyamanini did not show crossing by CF, two other Egyptian strains classed as Nyamanini did show slight one-way crossing with Quaranfil or Chenuda. If this crossing is verified, it is suggested that Quaranfil, Chenuda and Nyamanini be placed in a group to be designated as Quaranfil [2] .
For antigenic classification of tick-borne viruses, see Casals [3] . Neither Casals nor Kaiser [4] was able to detect relationship between Quaranfil, Chenuda, and Nyamanini. There is, however, a close relationship between Quaranfil and Johnston Atoll virus; see Reference [3] and Johnston Atoll registration in Catalogue. For world-wide distribution of the tick-borne viruses, see Yunker [5] .

Section VI - Biologic Characteristics

Virus Source (all VERTEBRATE isolates)
Blood (M), spleen (LV)

Lab Methods of Virus Recovery (ALL ISOLATIONS)
Newborn mice

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)	
Vero (CL)	SM 17					No plaques (13)			
LLC-MK2 (CL)					10	1 mm	4.7*		
BHK-21 (CL)	SM 20	5	2+-3+	7.5* (12)					

Produces CPE and plaques in tissue culture. Grows best in duck kidney or embryo tissue culture (2). Also propagates in rabbit kidney tissue culture (10), BHK-21 (12), and LLC-MK2 (13).

* Expressed in dex

Section VII - Natural Host Range (Additional text can be added below table)

Vertebrate (species and organ) and arthropod	No. isolations/No. tested	No. with antibody/No. tested Test used	Country and region
Man	2/3,286	6/38 * NT	Egypt (1, 2)
Bubulcus ibis (cattle egret)	4/66	19/33 NT	
Pigeon (squabs; pigeon houses)	1/43	0-100% NT	
Pigeon (adult; pigeon houses)		37/49 NT	Egypt (1)
Argas arboreus	48/534		Egypt (1, 2, 4)
Argas arboreus	Several		South Africa (6)
Argas (A.) hermanni	6		Afghanistan (7)
Argas (P.) arboreus	16		Nigeria (8)
Argas (A.) hermanni	1/60		Egypt (1, 2)
Argas vulgaris	4/15 pools		Iran (15)
Man		2.6%/191 CF	Lower Egypt (14)
Camels		12/137 CF	
Buffalo		24/108 CF	
Sheep		0/100 CF	
Pigs		12/101 CF	
Dogs		7/101 CF	
Donkeys		15/187 CF	
Rodents		0/94 CF	

* NT antibodies found in 6/38 children in village in which there was an infected rookery but only 18/214 in samplings elsewhere. All NT positives in pigeons were found in large pigeon houses known to be infected. No positive NT found in miscellaneous samplings of chickens, ducks, geese, crows, and pigeons not in large dovecotes. Abdel-Wahab (11) was unable to associate QRF virus with 133 encephalitis cases investigated in Egypt.

Section VIII - Susceptibility to Experimental Infection (include viremia)

Experimental host and age	Passage history and strain	Inoculation Route-Dose	Evidence of infection	AST (days)	Titer log10/ml
Mice (nb)		ic 0.02	Paralysis, death	4-6	6.0
Mice (nb)		ip 0.02	Paralysis, death	5-6	5.0
Mice (nb)		sc			
Mice (wn)		ic 0.03	Paralysis, death	5-6	6.0
Mice (wn)		ip 0.03	Irregular		
emb. eggs		ys 0.1	Death	2-3	4.0
young chicks		sc 0.1	Death		
guinea pigs		ip 0.1	Death		
hamsters		ip 0.1	Death		
rabbits		ip 0.1	None		

Section IX - Experimental Arthropod Infection and Transmission

Arthropod species & virus source(a)	Method of Infection log10/ml (b)		Incubation period (c)		Transmision by bite (d)		Assay of arthropod, log10/ml (e)		
	Feeding	Injected	Days	°C	Host	Ratio	Whole	Organ	System
Argas arboreus adults and nymphs infected by feeding or puncture transmitted by bite to 1-3 day chicks after extrinsic incubation periods of 12-57 days. Successful transmission experiments also with A. hermanni and Ornithodoros savignyi ticks. Can be propagated in serial passage by inoculation in Ornithodoros savignyi and larva of Indian meal moth (Plodia interpunctella) but not in Culex tarsalis and several other arthropods tested (9).									

Section X - Histopathology

Character of lesions (specify host)
sm: not well studied. Produces lesions in brains of mice similar to most encephalitic arboviruses; edema, congestion, petechial hemorrhages, perivascular cuffing, ganglion cell degeneration and focal necrosis.

Inclusion Bodies — Intranuclear
Lower Vertabrates

Organs/Tissues Affected

Category of tropism

Section XI - Human Disease

In Nature — Residual — Death
Reported

Subclinical — Overt Disease

Clinical Manifestations
Fever (R), prostration (R)

Number of Cases
Two

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

Section XII - Geographic Distribution

Known (Virus detected)
Egypt, South Africa, Afghanistan, Nigeria, Iran (15)

Suspected (Antibody only detected)

Section XIII - References

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Remarks

In the first registration of Quaranfil, information on the isolation of a strain from the blood of a child was given as this was the first isolation of this virus. But this was not identified until some time after the isolation of the virus from ticks. As most of the laboratory work at NAMRU-3 was done on Ar-1113, this strain is designated as the prototype (2) and its source and isolation recorded in this reregistration. However, another strain (Ar-1095) which was indeed the first strain isolated from A. arboreus and initially sent to Casals at RFVL has been used by him as the prototype of Quaranfil in his studies. Ar-1113 and Ar-1095 appear to be antigenically identical.