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ARBOVIRUS INFECTIONS OF MONKEYS CAPTURED IN THE JUNGLES OF NORTHERN NIGERIA

[Following is the translation of an article by B. F. Semenov and B. A. Lapin, Institute of Poliomyelitis and Viral Encephalitises, AMN USSR, Moscow and the Institute of Experimental Pathology and Therapy, AMN USSR, Sukhumi, published in the Russian-language periodical Voprosy virusologii (Problems of Virology), No 6, 1967, pages 755-757. It was submitted on 26 Dec 1966.]

The paper presents the comparative characteristics of the immunological structure of antibodies to 6 arboviruses in monkeys, large horned cattle, and also local residents in northern Nigeria.

The investigations were made in the beginning of 1966 as part of the combined medic-biological expedition from the USSR Academy of Medical Sciences.

Materials and Methods

The investigation was made on 100 sera from monkeys, primarily red marmosets (92 specimens), 100 sera from 2-3 year old zebu, and 64 sera from clinically healthy adults.

The hemagglutination-inhibition test, which was set up by the method of Clarke and Casals, was used for the determination of antibodies.

Serum inhibitors were removed with the help of acetone [1].

We used inactivated culture antigens from the following viruses: Middelburg (Mid) and chikungunya (Chik), and the infectious saccharose-acetone antigens of the following viruses: West Nile (WN), Uganda S (US), Dakar bat salivary gland virus (DV), and India g 690 (Ig 690).

The last 4 viruses were courteously presented to us by Doctor Casey, Director of the Rockefeller Foundation Laboratory in Ibadan (Nigeria). *

* We take this chance to thank Doctor Casey for making the work possible on the base of his laboratory.

Results

Human and animal sera were investigated with 2 viruses of type A (Mid, Chik), 3 viruses of group B (WN, DV, US), and one virus which was unclassified by group (Ig 690).

Circulation of all the mentioned etiological agents on the territory of Nigeria, with the exception of the Mid virus, was demonstrated by Dr. Casey in 1962-1964.

We established that monkeys which inhabited the jungles of northern Nigeria have antibodies both to mosquito arboviruses of group A and B and to the Ig 690 virus which is transmitted by ticks (Table 1). However, the frequency of infection with the different viruses turned out to be different.

Table 1

Immunological structure of antibodies in the population and animals of northern Nigeria to 6 arboviruses

	Число обследованных сывороток	Положительная РПГА (в %) с антигенами					
		Чик	Мид	ЗН	УС	ДВ	Ig 690
Обезьяны	100	6,0	3,0	23,0	17,0	10,0	3,0
Зебу	100	0	0	0	0	0	6,0
Люди	64	35,9	3,1	21,8	23,4	14,0	6,2

Key: (a) Number of sera investigated; (b) Positive hemagglutination-inhibition reaction (HIR) (in %) with antigens of; (c) Chik; (d) Mid; (e) WN; (f) US; (g) DV; (h) Monkeys; (i) Zebu; (j) Human.

Antibodies to the viruses of DV, US, and WN were found in 10, 17, and 23% of the cases respectively. In the investigation of sera with antigens of Mid and Chik positive results were obtained in 3 and 6% of the monkeys respectively. Antibodies to the Ig 690 tick-borne virus were detected in 3 specimens.

In the study of the immunological structure of various age groups it was noted that antihemagglutinins to viruses of group B are determined already in the 1st-2nd year of life and are followed up until the 16th year. In various periods of life it was not possible to note significant differences in the frequency of positive results (Table 2). Thus in 17.9% of monkeys up to 2 years old the sera reacted with the WN antigen, in 10.6% - with the US antigen, and in 10.6% - with the antigen of the DV virus. In the investigation of 5-8 year old animals antihemagglutinins were detected in 20.8, 8.3, and 20.8% of the cases respectively, and in the 9-16th year of life antibodies to the above mentioned etiological agents were determined in 40, 20, and 20% of the monkeys.

Table 2

Immunological structure of various age groups of monkeys for 6 arboviruses

(a) Возраст (в годах)	(b) Число обследо- ванных сывороток	(c) Процент положительных результатов с антигенами					
		(d) Чик	(e) Мид	(f) ЗН	(g) УС	(h) ДВ	Иг 690
1-2	24		3.5	17.9	10.6	10.6	
3-4	23		4.5	17.3	21.0	8.6	
5-8	17	16.6		20.8	8.3	20.8	8.3
9-16	10			40.0	20.0	20.0	10.0

Key: (a) Age (in years); (b) Number of sera investigated; (c) Percentage of positive results with antigens of; (d) Chik; (e) Mid; (f) WN; (g) US; (h) DV.

Antihemagglutinins to the Mid virus were found only in young animals (from 1 to 4 years old) and in a small percentage of cases (3.5-4.3%).

Antibodies to the Chik virus were detected only in 5-8 year old animals. Positive results were recorded in 4 sera out of 24 (16.6%).

Infected animals were noted only in the old age groups during the determination of antihemagglutinins to the tick-borne Ig 690 virus. Suppression of the hemagglutination reaction was observed during the investigation of 5-8 year old (8.3%) and 9-16 year old (10%) monkeys.

An analysis of results from the HIR with 3 antigens from group B makes it possible to propose that monkeys in northern Nigeria probably carry a silent infection which is caused by the WN and US viruses. The appearance of antibodies to the DV virus should be regarded as due to the development of heterologous antibodies as a result of repeated contamination.

Simultaneous with monkeys in one of the regions a study was made of the immunological structure of persons in the age group from 25 to 45 years. Antibodies to all the viruses used were detected in them. To antigens of the WN, US, and DV viruses antihemagglutinins were found in 21.8, 23.4, and 14% of the persons investigated respectively. Just as in the study of monkeys the number of sera which suppressed the hemagglutinating activity of the viruses of Ig 690 (6.2%) and Mid (3.1%) was small.

Very high was the percentage of persons who, based on data from the HIR, had had an infection which was etiologically connected with the Chik virus. Antibodies were detected in 1/3 of those investigated (35.9%).

A statistical analysis showed the significance of differences between the frequency of determination of antihemagglutinins to the Chik virus in man and monkeys.

In young zebu we were not able to reveal antibodies to the mosquito borne viruses of groups A and B. Antihemagglutinins to the virus of Ig 690 were found in 6 animals out of 100.

Thus under the conditions of northern Nigeria a similarity was noted in the immunological structure to certain mosquito borne and tick borne arboviruses in man and monkeys, though the specific importance of the various etiological agents in infectious pathology turned out to be different.

It is possible that with the organization of serological surveys on sparsely populated territories of the country with hot and moist climates monkeys may play the role of indicators of objectives (similar to pigs in Japanese encephalitis). Here there is the necessity of the investigation of animals of all age groups, since, as can be seen from our data, during a number of arbovirus infections (Chik, Mid) the degree of infection of monkeys of different ages turned out to be different.

In the jungles of northern Nigeria monkeys endure an infection which is etiologically connected with the viruses of Chik, Mid, WN, US, and Ig 690.

The similarity of the immunological structure in man and monkeys makes it possible to assume that the latter may play the role of indicator objects in the organization of serological surveys in uninhabited territories.

Literature

1. Clarke, D., Casals, J. Am. J. trop. Med. Hyg., 1956, v 7, p 561.
2. Karaseva, P. S., Semenov, B. F., Moshkin, A. V., et al., In the book "Urgent Problems of Virus Infections," Moscow, 1965, p 129.