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Hemagglutination-Inhibiting Antibodies to Arboviruses in the Population of Hajdu-Bihar District, Hungary

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Abstract. Blood samples from people living in Eastern Hungary were tested for the presence of hemagglutination-inhibiting antibodies to arboviruses. In the Hajduhadház area, 4 per cent of sera contained antibodies against the tick-borne encephalitis virus. Antibodies against the West Nile virus were discovered in 6 per cent of tested sera. Relatively high numbers of sera contained haemagglutination-inhibiting antibodies against the Ťahyňa virus in the human population of two mosquito areas. Four of 7 sentinel rabbits exposed in this area acquired antibodies against Ťahyňa virus during the summer of 1967. Serological survey on human population as well as antibody conversion in sentinel rabbits confirmed the endemic status of this virus in the studied area.

In one of our previous articles direct and indirect proof of the circulation of the tick-borne encephalitis virus in a restricted area of the Hajdu-Bihar district, in the surroundings of Hajduhadház, was presented (KUBINYI et al. 1967). In the present work we attempted to obtain serological evidence on the activity of arboviruses isolated in Central Europe in different areas of the Hajdu-Bihar district, by serologic tests.

MATERIALS AND METHODS

Description of the areas studied: The Hajdu-Bihar district can be divided into three different areas (Fig. 1). A. The eastern region is covered more or less with continuous forests, with mixed undergrowth of oak and acacia woods. Near the forest there are numerous, smaller or larger villages with intensive cultivation, and meadows frequently flooded by soil-water practically all the year. The human population lives partly in villages at the edge of the forest, partly on smaller farms scattered throughout the woods. The population of the villages comes into close contact with the forest either by forest culture or by grazing animals. This area is characterized by a high density of hunting game (e.g. deer and hare) as well as small rodents and insectivores. The flora and fauna of this area has been described in detail (KUBINYI et al. 1967). The frequency of mosquitoes is very high throughout the summer.

B. The Hortobágy plain, extending to the west of Debrecen is westwards bordered by the Tisza river. The surface is quite bare, with a vegetation of grass and heath-resistant plants and with

limited areas of agriculture. Its very characteristic formations are the numerous, smaller or larger fishponds and artificial channels. This area, a famous centre of animal-breeding (horse, cattle and sheep), is now growing into one of the greatest fisheries in Hungary. The flooded area of Tisza river is characterized by continuous acacia and willow-woods. This region is rich in hares, small rodents and insectivores. The human population lives mostly in villages along the river or the fish-

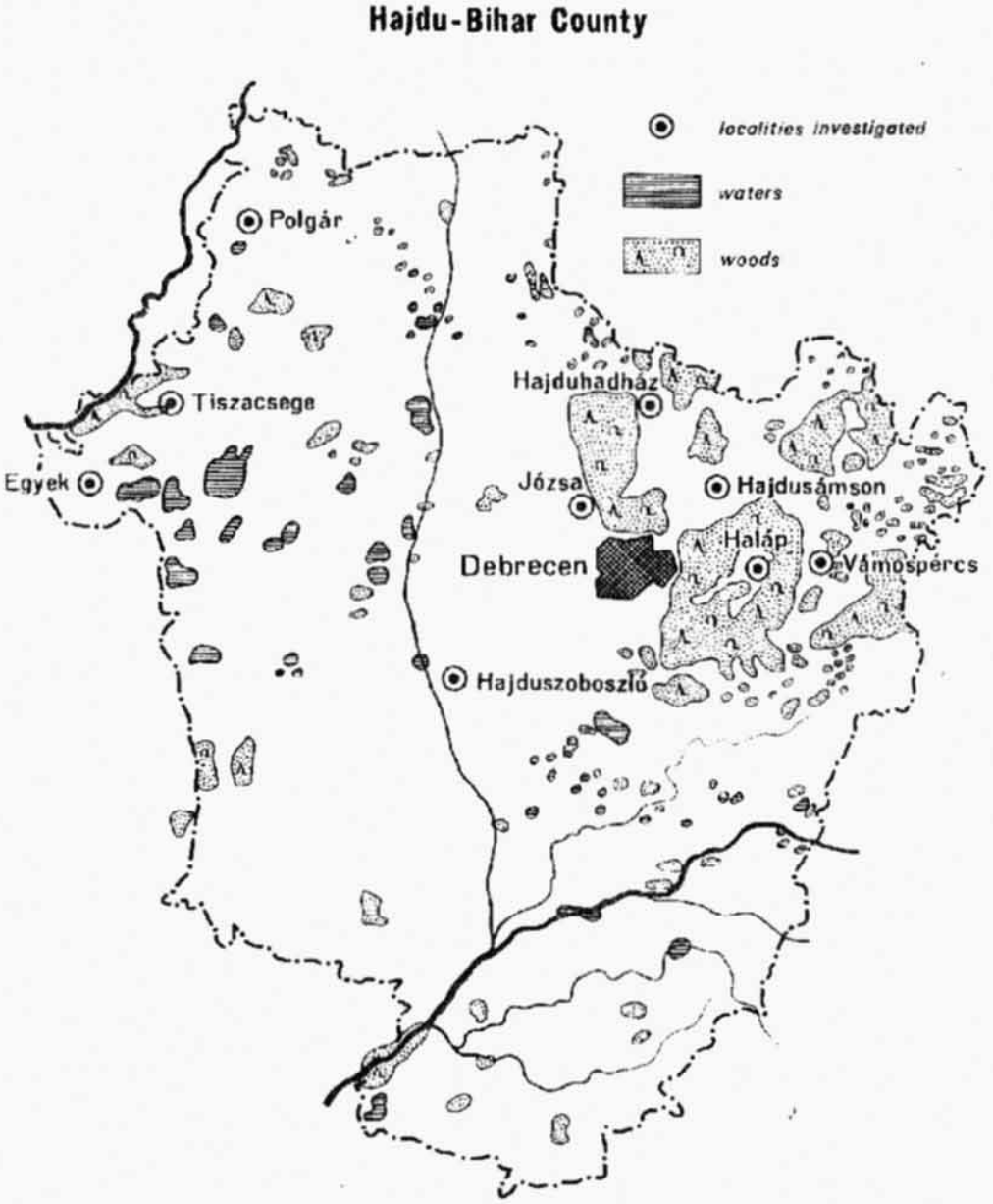

Fig. 1.

ponds. The frequency of mosquitoes is very high, especially in the season following greater floods of the river.

C. In the southern area the most characteristic formation is the river Berettyó with brooks and channels flowing into it.

Collection of materials. a) Human blood samples. Blood samples were collected in areas described under A and B from different age groups in February and March 1967. Four villages (Hajduhadház, Hajdusámson, Józsa and Vámospércs) were chosen in the eastern, and three (Polgár, Egyek and Hajduszoboszló) in the western area. The sera were kept frozen at −40 °C until examination.

b) Sentinel animals. Eight rabbits in pairs were exposed at four localities where the highest occurrence of mosquitoes was observed (Polgár, Tiszacsege, Egyek, and Haláp). The exposure lasted

from 8 July until 9 September. The rabbits were bled before exposure and weekly during the exposure. Sera were stored frozen at −40 °C until examination.

Haemagglutination-inhibition (HAI) tests. Tests were performed with unheated sera; human sera were extracted with kaolin, rabbit sera with acetone. Antigens were prepared from the brain of infected suckling mice by the method of CLARKE and CASALS (1958). The HAI test procedure of CLARKE and CASALS (1958) was used. The sera were examined in HAI tests against antigens for the following viruses: Chikungunya, tick-borne encephalitis (TBE), West Nile (WN), Ťahyňa and Čalovo.

RESULTS

Man. Results of HAI tests on human sera tested against Chikungunya, TBE, West Nile, Ťahyňa and Čalovo antigens are presented in Table 1. Sera giving a titre of 1 in 20 or higher were considered as positives. 3 of 80 sera from Hajdúhadház contained HAI antibodies to TBE virus. In other localities no antibodies to TBE virus were detected. Antibodies to West Nile virus were found in 5.68 % of the

Table 1. HAI antibodies to arboviruses in human sera from different localities of the Hajdú-Bihar district

Localities	Chikungunya	Tick-borne encephalitis	West Nile	Ťahyňa	Čalovo
	Per cent of positive reactions				
Hajdúhadház	0	3.75	3.75	1.25	1.25
Hajdúsámson	0	0	18.53	—	—
Józsa	0	0	3.84	—	—
Vámospércs	0	0	0	—	—
Polgár	0	0	6	—	2.63
Egyek	0	0	2.35	10.58	0
Hajdúszoboszló	0	0	5.26	22.20	0
Total % of positivity	0.28	0.85	5.68	7.65	1.14

Number of positive sera/number of sera tested
— = not tested

Table 2. HAI antibodies to arboviruses in sentinel rabbits

Antigens	Per cent of positive reaction	
	before exposure	after exposure
Chikungunya	0	0
Tick-borne encephalitis	0	0
West Nile	0	0
Ťahyňa	0	11*)
Čalovo	0	0

*) Titers of 1 in 20, or higher considered as positives.

sera; the highest percentage of positive reactions was found in the village of Hajdusámson. 8 per cent of the 183 sera contained antibodies against Ťahyňa antigen. The highest incidence of HAI antibodies was found in the people of the village Egyek and Hajduszoboszló (Tab. 1). Only 2 of the 175 tested sera contained HAI antibodies to Čalovo virus and one of the sera reacted with Chikungunya virus, used as control.

Table 3. HAI antibody titers to Ťahyňa virus in sentinel rabbit sera

Month		July				August				Sept.
Day		8	15	18	27	10	17	24	31	9
Rabbit No.	Locality									
1.	Polgár	0	0	0	0	0	0	0	0	0
2.	Polgár	0	0	0	0	0	0	20	40	80
3.	Tiszacsege	0	0	0	0	0	0	40	0	0
4.	Tiszacsege	0	0	0	0	0	0	40	40	0
5.	Egyek	0	0	0	0	0	0	0	10	0
6.	Egyek	0	0	0	0	0	0	–	20	0
7.	Haláp	0	0	0	0	0	0	0	0	0
8.	Haláp	0	died during the first week							

Reciprocal values
0 — negative
— — not tested

Rabbits. The sera of sentinel rabbits were tested with the same antigens as human sera. Positive reactors were found to Ťahyňa virus only (Tab. 2). 11 per cent of all samples contained HAI antibodies in a titre 1 in 20 or higher against Ťahyňa antigen. The kinetics of antibody formation in rabbits is shown in Table 3. The results presented in this table show that HAI antibodies appeared from the 7th to 8th weeks after the exposure and persisted up to the 9th weeks after the exposure.

DISCUSSION

Human and sentinel rabbit sera were examined for the presence of antibodies against arboviruses. From group B arboviruses, antibodies against the tick-borne encephalitis virus were discovered in 4 per cent in the Hajduhadház area which was found to be a natural focus of TBE virus (Kubinyi et al. 1967). The presence of haemagglutination-inhibiting antibodies against West Nile virus is of interest in view of positive findings of antibodies against this virus in Austria (Kunz 1963) and in Czechoslovakia (Grešíková and Sekeyová 1967).

Our results show the occurrence of HAI antibodies against Ťahyňa virus in the human population of Egyek and Hajduszoboszló which are located in a mosquito

area. The prevalence of HAI antibodies against Ťahyňa virus in the mosquito area corresponds to the results of GREŠÍKOVÁ and SEKEYOVÁ (1967), who found nearly the same positivity rate with this virus in Eastern Slovakia. The serological conversion of sentinel rabbits may be another proof of the circulation of the Ťahyňa virus in this area. KOLMAN et al. (1966) successfully used sentinel rabbits to demonstrate Ťahyňa virus circulation in a natural focus in Czechoslovakia.

The relationship of Ťahyňa virus to human disease is still unsolved. The virus was suspected as the causative agent of some acute febrile illnesses (BÁRDOŠ 1965) occurring most frequently in a grippal clinical form with pharyngitis and tonsillitis (SLUKA 1966). The statistical survey on the occurrence of grippal illnesses in Polgár in the period of June—September shows a continuously rising number of cases, mostly in the lower age groups; however, it is still unclear whether the Ťahyňa virus causes any illnesses in the studied area.

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