TRANSPLACENTAL TRANSMISSION OF ANTIBODIES AGAINST FRACTION I OF *Pasteurella pestis* TO THE OFFSPRING OF EXPERIMENTAL ANIMALS

L. G. Gerasyuk

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The transplacental transmission of antibodies to the offspring in mammals has been described by several authors [1, 5]. Recently antibodies against fraction I of Pasteurella pestis were described in the offspring of narrow-headed voles aged 45-50 days, infected with experimental plague [2], and in the offspring of naturally immune great gerbils [4].

The object of the present investigation was to determine whether antibodies against fraction I of P. pestis are transmitted to the offspring of female laboratory animals immunized with living vaccine against plague or with fraction I.

EXPERIMENTAL METHOD

Female albino mice (40), female albino rats (50), female guinea pigs (40), and female rabbits (18) were immunized 4-6 times with living EV vaccine and with fraction I of P. pestis prepared by Baker's method.

The antigen was injected subcutaneously or intradermally in doses optimal for each animal species. The first immunization with fraction I was carried out on an adsorbent (a 2.5% suspension of aluminum hydroxide) and the later injections in physiological saline. The progress of antibody formation was verified by the passive hemagglutination reaction with the corresponding standard diagnostic serum of the Rostov-on-Don Plague Research Institute.

To produce offspring, the female rabbits with antibodies in their serum in dilutions of between 1 : 5120 and 1 : 100,000 were mated with males 2-3 days after the last injection of antigen. The female albino mice, albino rats, and guinea pigs were immunized before and during pregnancy. The levels of the antibody titers were determined in the parturient animals and in some of their young on and at intervals after the day of birth, using the passive hemagglutination reaction with erythrocytes sensitized with fraction I. In the case of the guinea pigs, rabbits, and albino rats blood was taken from the heart, and in the case of the mice, from an incision in the tail or from the retro-orbital venous sinus. The pregnant female albino mice and albino rats with high titers of antibodies in their sera was sacrificed, and their embryos, placenta, and amniotic fluid were investigated by the method described previously [3, 4].

Distribution of Antibodies in Embryo, Placenta, and Aminotic Fluid of Pregnant Albino Mice

Activity of sera of pregnant females	No. of embryos tested	Geometrical mean titer of antibodies		
		in body of embryos	in placentas	in amniotic fluid
5 120	8	128	97	24,2
5 120	5	128	112	69
5 120	6	79	64	24,2
2 560	7	69	79	42
2 560	6	158	128	97
1 280	7	128	128	45
640	7	45	45	37
320	5	28	28	9,8
80	8	16	12,1	9,8

EXPERIMENTAL RESULTS

Antibodies against fraction I were found in the embryos, placenta, and amniotic fluid of the pregnant female albino mice immunized with fraction I and with living vaccine (see table).

A definite relationship was observed between the levels of the antibody titers in the females, the embryos, the placentas, and the amniotic fluid.

Analogous results were obtained during the investigation of the pregnant albino rats.

In 12 female albino mice immunized with fraction I and with living vaccine transplacental transmission of antibodies against fraction I to their offspring was found. The sera of the

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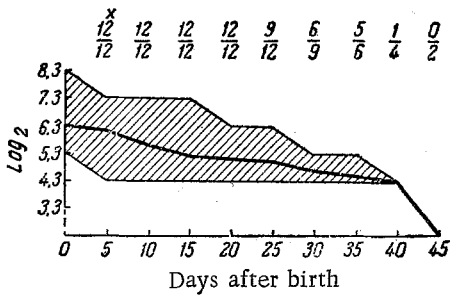

Fig. 1. Levels and dynamics of antibodies in offspring of immunized albino mice. x— Ratio between number of animals with antibodies in their serum at that particular time and the number of animals tested.

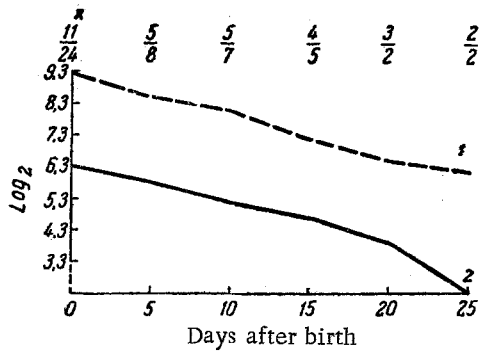

Fig. 2. Levels of titers and dynamics in immunized guinea pigs and their offspring. x— Ratio between number of maternal sera investigated and total number of young animals tested; 1) antibody curve in females; 2) antibody curve in young.

females on the day of giving birth to their young were 4-13 times more active in the passive hemagglutination reaction than the sera of the newborn animals (Fig. 1).

The length of time during which specific antibodies were present in the offspring did not exceed 40 days after birth. The periods of detection of the antibodies were longer in the young animals born from mothers with high titers of antibodies in their sera.

In the albino mice the transmission of antibodies to the offspring took place not only through the placenta, but also through the milk. This was shown by cross feeding of young mice born from immunized and unimmunized females.

From nine albino rats immunized with living vaccine, with antibodies in their sera in dilutions of between 1 : 80 and 1 : 1280, 43 young rats were born. Antibodies were detected in the serum of the young rats in titers of 1 : 20-1 : 80.

The activity of the sera of the young rats was between 1/4 and 1/16 of the activity of the maternal sera. Antibodies transmitted to the offspring were discovered 25-40 days after birth.

An injection of 20 μg fraction I without adsorbent was given to 5-day and 30-day old rats born from immunized and unimmunized females. No antibodies were found in the sera of the rats born from the unimmunized females on the 2nd, 5th, 7th, 10th, and 13th days after receiving a single injection of the antigen. On the other hand, in the sera of the young rats born from immunized mothers, antibodies were found (1 : 20-1 : 40) on the 2nd day after injection of fraction I, and their titer later rose to 1 : 320. The level of the antibody titers gradually fell, and by the 30th-35th day the passive hemagglutination reaction with the sera of the actively immunized young rats was negative.

In the offspring receiving antibodies from the immune female (geometrical mean titer 294) on the 2nd day after injection of the antigen, antibodies were found in a dilution of 1 : 398. On the 15th-20th day the level of the antibody titers reached its maximum (1 : 1350), and then gradually fell, so that on the 40th-50th day no antibodies were detected in the sera of the young animals.

The offspring of the immunized and unimmunized mother rats were fed on their mothers' milk.

In 24 young born from 11 female guinea pigs receiving living vaccine together with fraction I, passively transmitted antibodies were found in dilutions of 1 : 32-320, i.e., in titers 1/4-1/12 of the maternal titers (Fig. 2).

The sera of the young guinea pigs 25 days after birth gave a negative result in the passive hemagglutination reaction, whereas antibodies were found in the sera of their hyperimmune mothers in dilutions of 1 : 80-1 : 320.

The 8 female rabbits immunized with living EV vaccine or with fraction I gave birth to 12 young, and antibodies against fraction I were found in their sera in titers of between 1 : 128 and 1 : 2560.

The length of time during which the passively transmitted antibodies remained in the young animals depended on the activity of the maternal sera.

Antibodies were found in the young animals until the 50th day after birth, whereas at this time antibodies were still present in their mothers in relatively high titers (1:256-1:640).

Hence these experiments demonstrated the transplacental transmission of antibodies against fraction I to the offspring of albino mice, albino rats, guinea pigs, and rabbits immunized with living plague vaccine or with the surface antigen of P. pestis. Passively transmitted antibodies were found in the offspring for 10-50 days depending on the initial antibody titer in the newborn animals. The sera of the young of all the species of animals used in the experiments were only 1/4-1/16 as active as the maternal sera in the passive hemagglutination reaction.

The young of immune female rats at the age of 5 and 30 days were capable of giving an immunological response to injection of homologous antigen without adsorbent.

SUMMARY

Using the reaction of passive hemagglutination, it was possible to follow the dynamics of transplacental transmission of antibodies to fraction I of the plague bacillus by females of various species of laboratory animals. The titers of antibodies received by the young were 4-16 times less than those in their mothers. Passively transmitted antibodies were discovered in the young within 10 to 50 days after birth. Rats aged from 5 to 30 days born of immune females responded to single active immunization by an increase in the titer of corresponding antibodies.

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All abbreviations of periodicals in the above bibliography are letter-by-letter transliterations of the abbreviations as given in the original Russian journal. *Some or all of this periodical literature may well be available in English translation.* A complete list of the cover-to-cover English translations appears at the back of the first issue of this year.
