DEVELOPMENT OF NATURAL IMMUNITY IN PROGENY OF DOGS WITH A NORMAL COURSE OF PREGNANCY

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Immune reactions in dog fetuses appear during the last third of intrauterine development: ability to carry out phagocytosis of Shigella sonnei cells is present and normal antibodies against these cells can circulate in the blood stream. After birth and the beginning of colostrum feeding the immunologic properties of the puppies' blood increase sharply along with a rapid rise in the blood level of γ-globulin. On the change over to feeding on mature milk the phagocytic indices of the blood fall significantly along with a decrease in the blood level of γ-globulin. After the beginning of independent feeding the immunobiological properties of the puppies' blood again increase.

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The object of this investigation was to study the development of natural immunity in dog fetuses and puppies in the course of normal pregnancy. The antibody titer, the complementary, bactericidal, and phagocytic properties, and the protein composition of the animals' blood were studied.

EXPERIMENTAL METHOD

Living Shigella sonnei cells were used as antigen. Antibodies in the serum were detected by the indirect immunofluorescent method with a luminescent serum against dog globulins labeled with fluorescein isothiocyanate. Complementary activity was determined by a photocolorimetric method in the modification of Gabrilovich and Soboleva [2]. The bactericidal properties of the serum were studied by counting the number of viable bacteria after contact between serum and culture and expressed in indices as described by Karolček [3]. For studying phagocytosis the blood was mixed with 2.5% sodium citrate and a suspension of 2 billion bacterial cells/ml in proportions of 2:1:1 and incubated for 30 min at 37°, after which it was grown on agar for 60 min to determine the digestive power of the neutrophils [1]. Phagocytosis was judged on the basis of the usual indices: the phagocytic index (PI), the intensity of phagocytosis (IP) in percent, and the degree of completion of phagocytosis (CP) in percent.

TABLE 1. Dynamics of Immumologic Indices of the Blood in Dogs (M ± m)

Age group of animals	Titer of antibodies (Coons method)	Titer of complement $C'H_{50}$ (in ml)	Bactericidal index	Index of phagocytosis		
				PI	IP (in %)	CP (in %)
Fetuses						
7 weeks (15)	1:10—1:20	18,3±0,3	—0,19±0,07	1,1±0,1	6,4±1,6	84,0±1,7
9 " (10)	1:10—1:20	40,5±2,4	—0,19±0,02	1,2±0,06	6,6±0,9	93,4±1,7
Puppies						
Newborn (22)	1:20—1:40	52,8±2,5	0,70±0,06	2,3±0,4	15,8±3,1	90,2±2,2
4-day (30)	1:20—1:40	79,2±4,8	1,16±0,11	2,6±0,2	27,8±3,2	92,0±1,2
8-day (18)	1:20—1:40	140,0±8,6	1,49±0,16	1,9±0,09	10,8±3,1	96,8±0,8
12-day (34)	1:20—1:40	160,0±9,8	0,95±0,21	1,5±0,1	12,4±1,0	95,8±0,2
21-day (29)	1:20—1:40	138,8±3,9	1,04±0,08	2,3±0,2	18,4±1,7	95,7±0,9
28-day (27)	1:20—1:40	141,9±4,1	1,13±0,12	2,2±0,1	20,2±1,8	96,2±0,8
Mothers (17)	1:40	113,6±6,1	1,60±0,18	3,5±0,3	44,4±3,0	95,4±0,2

Note. Number of animals given in parentheses.

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EXPERIMENTAL RESULTS

The results given in Table 1 show that in the last third of intrauterine development the fetuses exhibit ability to complete a phagocytic reaction, with the appearance of signs of humoral immunity. Normal antibodies detectable by the Coons method were evidently formed by the fetuses themselves, for penetration of maternal immunoglobulins into the fetal blood is obstructed because of the structural nature of the dog's placenta, which is epitheliochorial type 4. On the whole, however, humoral components of immunity in the fetus were not yet sufficiently mature for exhibition of bactericidal properties by the serum or for a marked phagocytic activity of the blood.

After birth of the puppies and the beginning of colostrum feeding, the immunologic properties of their blood increased sharply. This period coincides with the appearance and rapid growth of the γ-globulin protein fraction in the puppies' blood, which in the first two days after birth rises almost to the maternal level ($10.2 \pm 0.5\%$). With the changeover to feeding on mature milk (8-12th day), the phagocytic and bactericidal indices of the puppies' blood fell significantly. At the same time, the content of the γ-globulin protein fraction fell ($5.1 \pm 0.1\%$). After the beginning of independent feeding (on the 21st day), the immunobiological properties of the puppies' blood began to increase once more. The development of natural immunity in the progeny of dogs with a normal course of pregnancy thus takes place in a series of successive stages, determined by general physiological maturation and the character of feeding of the animals.

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