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Blood Groups and Splenomegaly in Chick Embryos

Abstract. The B blood group locus in chickens is shown to be associated with the graft-against-host reaction in chick embryos.

In a recent paper Schierman and Nordskog (*1*) have shown that when chicken donors and hosts have the same B blood group allele, survival of skin grafts is prolonged. A similar relationship exists in the mouse, where strains differing in alleles of the H-2 locus not only manifest accelerated rejection of tissue grafts but also differ in respect to red cell antigens (*2*). In addition Billingham (*3*) has reported more severe "runting" symptoms in baby mice made tolerant with cells from strains differing at the H-2 locus. It appears, then, that genes of the H-2 locus are involved in histocompatibility and blood group difference and that they also play a role in the graft-against-host reaction.

Information about the physiological function of cell antigens is of profound biological significance and the purpose of this investigation is to add to this knowledge by exploring the relationship between red cell antigens and the induction of splenomegaly in non-inbred lines of chickens.

Sterile blood was obtained from adult hens of three B locus genotypes, designated B 19/19, B 21/21 and B 19/21. Fifteen-day-old embryos of all three genotypes each received 0.1 ml of blood intravenously from a single donor. The weights of the spleens removed 4 days later, which were used as a quantitative indication of the graft-against-host reaction (*4*), are shown in Table 1.

Table 1. Average spleen weights and standard errors for chick embryos injected with blood from blood-grouped adult female donors.

Donor hens		Av. wt. (mg)	Embryos (No.)
Blood type	No. used		
Blood type of hosts 19/19			
19/19	1	16.9 ± 1.2	24
19/21	2	15.5 ± 0.9	24
21/21	3	98.8 ± 6.8	37
Controls		11.8 ± 0.7	12
Blood type of hosts 19/21			
19/19	1	81.3 ± 6.7	9
19/21	2	19.3 ± 1.5	3
21/21	3	118.9 ± 12.7	10
Controls		14.8 ± 0.9	13
Blood type of hosts 21/21			
19/19	1	96.1 ± 6.9	28
19/21	2	16.4 ± 0.9	22
21/21	3	18.7 ± 1.0	27
Controls		12.2 ± 0.6	11
Ungrouped			
19/19	1	76.3 ± 5.7	27
19/21	2	65.4 ± 9.0	20
21/21	3	84.1 ± 8.7	19
Controls		13.8 ± 0.7	11

From these figures it is clear that where host and donor are of the same B locus genotype, little or no splenomegaly is produced, whereas considerable enlargement of the spleen occurs where they differ. The figures from the B 19/21 donors are particularly relevant to the graft-against-host nature of this phenomenon, in that although the donors' blood type differs from that of two of the host groups, no enlargement occurs in any of them, since the hosts do not possess any B group antigens foreign to the donors. The slight enlargement seen in the groups where none would be expected if only the B locus were involved, presumably indicates that other antigens play an additional, if minor, role.

Whether the underlying genetic situation here resembles that of the H-2 region in the mouse or that of other antigen complexes in man and cattle must remain in doubt until time has afforded further opportunities for the detection of recombinations. In any event, the variety of effects associated with the B locus (see also *5* for the relationship with reproductive fitness) suggests that this region of the fowl chromosome exerts a profound effect on cell functions.

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Calcium and Other Ions in Blood and Skeleton of Nicaraguan Fresh-Water Shark

Abstract. The bull shark, *Carcharhinus leucas*, employing archaic but effective means of regulating the physical-chemical composition of its body fluids, thrives in tropical fresh-water rivers and lakes. The ionic strength of the serum and the concentrations of total solutes, calcium, urea, and other ions are below the levels found in marine elasmobranchs but higher than the levels in teleosts. The patterns of the calcium deposits of the vertebrae are identical in marine and fresh-water subspecies.

Migrations into fresh water of the bull sharks of Lake Nicaragua in Central America, Lake Sentani of western Dutch New Guinea, and the Ganges and other Asiatic rivers have been reported by Herre (*1*) and Boeseman (*2*). The physiology of these fishes presents extraordinary mechanisms of ion and osmotic regulation. Smith (*3*) reported a decrease in the serum concentration of urea with relatively little change in phosphate or chloride in small sharks and sawfish found in rivers of Malaya and Siam; no data were recorded about the other solutes of the blood. My previous research (*4*) has included work on the chemistry of calcium and the major components of the blood and skeleton of the bull shark of the Atlantic, *Carcharhinus leucas*, and 13 other species of marine elasmobranchs, but none were fresh-water migrants.

On 27 March 1962, one tarpon (*Megalops atlanticus*) and four bull sharks, three females and one male, ranging in length from 5 feet 11 inches to 7 feet 1 inch, were taken in southeastern Nicaragua from Rio San Juan (*5*) near El Castillo. Small fishes, alligators, and viscera of swine were used as bait, but only freshly caught tarpon brought results. The fish were photographed after exsanguination by cardiac puncture and section of the caudal artery. Blood was collected in thermos