Table 1. Influence of *B* locus genotype with respect to homograft tolerance.

Family designation No.	Birds (No.)	Genotype of host	No. of grafts accepted (+) and rejected (−) from donor of genotype shown					
			B^1/B^1		B^1/B^2		B^2/B^2	
			(+)	(−)	(+)	(−)	(+)	(−)
3168	3	B^1/B^1	4	0	0	8		
	4	B^1/B^2	8	0	6	0		
3159	4	B^1/B^1	7	0	0	6		
	3	B^1/B^2	6	0	6	0		
19	2	B^1/B^2					6	0
	3	B^2/B^2			0	6	5	0

The purpose of the experiment reported here (*7*) was to determine genetic relationships between different blood group genotypes and histocompatibility in an inbred line of Leghorn chickens. Nineteen chicks from three females but having a common sire were used. Inbreeding coefficients ranged from 0.45 to 0.49. Two alleles were segregating at each of four independent loci determining red cell antigens. This included the *A*, *B*, and *L* loci in family No. 3159, the *B*, *D*, and *L* loci in family No. 3168, and the *B* and *L* loci in family No. 19. Prior to grafting, the chicks were blood typed by tube agglutination with isoimmune sera. These sera, considered specific for this line of birds, were used to identify antigens designated A_1, A_2, B_1, B_2, D_1, D_2, L_1, and L_2. Reference reagents, supplied by a commercial firm, were used to establish that the blood group systems studied corresponded to the systems ascertained by other workers (*8*).

A total of 70 whole thickness skin grafts were made 16 days after hatching occurred. Tissue was exchanged between full sibs only and also reciprocally so that each chick was both donor and host. Chicks received from two to four 8-mm-square grafts, but not more than one graft from the same donor. Location of the graft was randomly assigned to one of four positions on the back. Grafts were exchanged such that the donor had 0, 1, or 2 identifiable red cell antigens not in common with the host. Beginning on the 6th day after grafting began, grafts were observed daily for 1 week and on alternate days thereafter. The grafts were scored for degree of vigor by a series of arbitrary grades (*2*) which provided an accurate determination of graft rejection time.

Two of the homografts were lost because of faulty technique soon after grafting. In 38 of the remaining 68 grafts, the donor possessed one or more red cell antigens not possessed by the host. Twenty such donor-host red cell incompatibilities were, with respect to *B* antigens, either alone or in combination with antigens of the other three systems. These 20 grafts exhibited the typical pattern of an immunological reaction by showing signs of rejection on the 7th postoperative day; all had been sloughed off 5 days later. The remaining 48 grafts appeared healthy and were considered to have been accepted by the host at this time.

Thus, rejection occurred only when B_1 or B_2 donor red cell antigens were not also present in the host. The results presented in Table 1 indicate that the *B* locus in chickens not only determines red cell antigens but is also a major histocompatibility locus. This would suggest that red cells may share antigens with the skin which are directly involved in histocompatibility. Studies with birds of known blood type should help to explicate the contradictory results obtained where erythrocytes have been used to induce skin graft tolerance.

The number of remaining donor-host differences involving loci *A*, *D*, and *L* were 8, 4, and 13, respectively. These differences, as well as differences in sex, were not found to influence histocompatibility to the 40th postoperative day. However, five grafts were rejected during the 5th week after grafting. A gradual and less violent reaction was observed in these cases than that previously noted. Thus, it appears that alleles at other loci determining comparatively weak histocompatibility antigens may be segregating in this inbred line. It is well known that sloughing often occurs even after long periods of graft tolerance. Alleles and loci other than those examined in this study may well have variable differences in their effects on histocompatibility.

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4 May 1961

Electrophoretic Analysis of the Serum Proteins of Neurological Mutations in Mice

Abstract. The serum proteins of three neurological mutations, tremulous, quivering, and waddler, were studied. The albumin level rose while the globulin level, especially the level of alpha fraction, fell in tremulous mice, but the trend was reversed in quivering mice. In waddler mice the changes were observed only in females.

During the past few years a large number of neurological mutations have been reported in mice by various investigators. These mutations, as briefly reviewed by Yoon (*1*), may be classified into two large categories: the waltzer-shaker type and the trembler-waddler type. A rapid circular movement is a common characteristic of the waltzer-shaker type, but this movement is absent in the trembler-waddler type. Instead, the latter shows various combinations of the following traits: tremor, paralysis of front or hind legs or of both, muscular incoordination, loss of straightening reflex, locking hindlegs when picked up by the tail, priapism, epileptic form of convulsion, and reduction or loss of fertility. In the search for a biochemical basis for these genetic abnormalities, the serum protein patterns of three trembler-waddler type mutations, quivering (gene symbol, qv), waddler (gene symbol, wd), and tremulous (gene symbol, tm) (*2*) were studied. Electrophoresis was carried out in a Durrum-type electrophoresis cell with Schleicher and Schuell 2043-A mgl paper strips (Spinco No. 300-846) and

Table 1. Relative levels of serum proteins, in percentages, in three strains of mice, Tm, Qv, and Wd. All three mutations are simple recessives. Therefore, Tm--, Qv--, and Wd-- indicate normal mice from the Tm, Qv, and Wd strains, and tmtm, qvqv, and wdwd indicate affected mice from the respective strains.

Strains	Genotypes	Sex	No. of determinations	Albumin			Globulin		
				$\bar{x}$	$s_{\bar{x}}$	Difference, P	Alpha	Beta	Gamma
Tm	Tm--	M, F	28	66.95	0.59		10.59	14.96	7.50
	tmtm	M, F	14	74.76	1.17	<0.001	6.22	12.69	6.33
Qv	Qv--	M, F	10	66.36	0.80		11.18	14.44	8.02
	qvqv	M, F	10	60.55	1.97	<0.05	11.46	17.17	10.82
Wd	Wd--	M, F	14	70.45	0.52		9.00	12.89	7.66
	wdwd	F	8	73.95	1.49	<0.05	5.89	11.34	8.82
	wdwd	M	8	70.81	0.76		10.25	11.73	7.21

a constant current of 2.5 ma (75 volts) for 16 hours, by use of the improved techniques described by William, Pickels, and Durrum (*3*). A barbiturate buffer, *p*H 8.6, ionic strength 0.075, was used as electrolyte. The elution technique was adopted for the quantitative determination of the proteins, and a spectrophotometer at a wavelength of 590 mμ was used to read the solution. Bromophenol blue was the dye employed in this procedure. The serum components were labeled as albumin and as alpha, beta, and gamma globulin, in analogy with components of human serum. No effort was made to identify different fractions of each of these components. Both affected and normal mice between 5 and 7 months of age were obtained from strains designated as Quivering (strain symbol, Qv), Waddler (strain symbol, Wd), and Tremulous (strain symbol, Tm) that have been maintained by sib matings for various numbers of generations at Genetics Laboratory of Boston College.

The results of this study are summarized in Table 1. The relative levels of the various components of the serum proteins vary only slightly from strain to strain among normal mice. However, significant changes were observed in the affected animals of all three strains. In the Tm strain, a significant proportional increase in the albumin level and accordingly a proportional decrease of the globulin level were observed. Most of the decrease in the globulin level was accounted for by the sharp decrease in alpha fraction. In the Qv strain, in contrast to the Tm strain, the level of albumin fell considerably in the affected mice and there was an increase in the globulin level. Increased levels were seen in both the beta and gamma fractions, but the alpha fraction remained practically the same as in the normal mice. This is graphically shown in Fig. 1. These differential changes of the serum protein patterns seem to indicate that, although tremulous and quivering mice are strikingly similar in their phenotypic expression, they may result from alterations in different biochemical pathways.

In the Wd strain, the result was more complicated. The affected males showed no significant changes as compared to their normal sibs, but the affected females showed tendencies similar to those observed in the Tm strain. The level of albumin rose and that of the globulin, especially the alpha fraction, dropped. This indicates that the changes in waddler females may be secondary rather than primary effects of this genetic disorder. Since it was observed that the variances in affected mice of all three strains were higher, although statistically not significant, than those in the normal mice, this may be true for tremulous and quivering mice also, if it is assumed that the higher variances are due to gradual changes that take place in the affected mice and that some mice are affected more severely than others at any particular time (*4*).

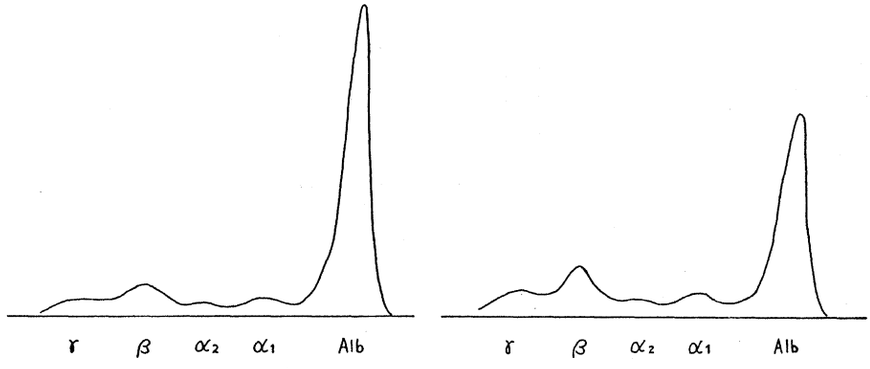

Fig. 1. Electrophoretic patterns of tremulous (left) and quivering (right) mice, showing changes in opposite directions.

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11 July 1961

Preliminary Method for Estimating Stability in Plankton

Abstract. The stability of plankton in the York River, Virginia, during the summer of 1960 is computed by a derived empirical stability measure. The communities were indicated to have considerable homeostasis, being over five times more stable than the physical biotope.

In connection with a study of plankton productivity in the York River during the summer of 1960, data were obtained at a station about 300 yards off the pier at the Virginia Institute of Marine Science in 10 consecutive weeks (between 22 June and 25 August) for a number of pertinent variables. In studying these data, it became desirable to know something about the resistance of the communities to change of state.

A number of stability tests are available for linear systems from formal stability theory (*1*), but unfortunately these depend mostly on the nature of the latent roots λ (eigenvalues) of the characteristic equation.

$$\phi(\lambda) = \lambda^n + m_1 \lambda^{n-1} + m_2\lambda^{n-2} + \ldots + m_n = 0 \quad (1)$$

of matrix A in the homogeneous equations

$$(A - \lambda I_n)X = 0 \quad (2)$$