Table 2. CHICK GROWTH AND FEED CONSUMED PER UNIT GAIN (UNTIL FOUR WEEKS OF AGE)

Group No.	Vitamin D supplement: Cod liver oil* %	Vitamin D supplement: Deltafor D_3—400† %	Vitamin D supplement: Approx. I.U. per kgm. diet	Vitamin B_{12} (μgm. per kgm. diet)	Gain‡: abs. (gm.)	Gain‡: rel. %	Feed per kgm. gain (kgm.)
1	0	0·05	200	0	128	100	3·06
2	0	0·05	200	30	134	105	3·01
3	0·4	0·1	640	0	110	86	3·45
4	0·4	0·1	640	30	141	110	3·03
5	0·4	0·3	1,400	0	106	83	3·29
6	0·4	0·3	1,400	30	144	112	3·04

* 1,000 I.U. vitamin A, 60 I.U. vitamin D per gm.
† 400 I.U. vitamin D_3 per gm.
‡ Gain between one and four weeks, average males–females.

From this table it is evident that the two higher vitamin D supplements had significant growth-depressing effects in the groups with no vitamin B_{12}. Supplementing the diet with vitamin B_{12}, however, eliminated these effects.

Details of this and other experiments in this series will be published elsewhere.

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Deoxyribonucleoproteins of Cell Nuclei : Sensitivity to X-Rays

STUDIES of aqueous systems of intact deoxyribonucleoproteins[1] showed that they were markedly unstable. Storage at 2°–5° C. for 24–36 hr. produced a substantial depolymerization of the deoxyribonucleic acid component. This is in marked contrast to the stability of dissociated nucleoproteins in 1·0 *M* sodium chloride. It was felt that this instability might be functionally significant in the mechanism of radiation effects on biological systems. Studies were therefore made of the effects of X-radiation on aqueous nucleoprotein gels.

When isolated calf-thymus nuclei are placed in water, there is a rapid gelation, an increase in volume, and lysis of the nuclei. Further additions of water produce a further increase in the volume of the gel, a concomitant decrease in rigidity, and eventually an aqueous nucleoprotein solution. Such gels have a high and anomalous viscosity and are very susceptible to degradation, losing viscosity rapidly at 25°, more slowly at 2°–5° C. When they are exposed to low doses of X-rays no immediate effect is apparent. After 4–6 hr. storage of the irradiated gel at 2°–5° C., there is an acceleration of the spontaneous loss of viscosity. The effect is proportional to dose in the range studied (250–5,000 r.).

The observed effect is a decrease in the structural viscosity of the nucleoprotein gel and relates to the interactions between deoxyribonucleoprotein molecules. In 1·0 *M* sodium chloride, the structural viscosity of the nucleoprotein gel is abolished, and the nucleic acids and proteins are dissociated. Under these conditions it is possible to measure the intrinsic viscosity of the deoxyribonucleic acid. The doses of X-radiation used had no effect on the intrinsic viscosity of the deoxyribonucleic acid, whereas the spontaneous loss of viscosity of non-irradiated gels involves depolymerization and a decrease of intrinsic viscosity.

Exposure of isolated nuclei to 1,000 r. of X-rays markedly decreases the capacity of these nuclei to swell when placed in water. This is in agreement with previous observations[2] that X-rays inhibit trypsin-induced swelling in salivary glands of *Drosophila* larvæ.

With regard to the loss of viscosity observed in the nucleoprotein gels, there are apparently at least two separate factors involved. The lack of any immediate effect of X-radiation on the gel or on its deoxyribonucleic acid component strongly suggests that the observed phenomena involve primarily the interactions of the protein moieties of these systems. Further details of this work will be published in due course.

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Analysis of Unordered Tetrads Segregating for a Lethal or Other Epistatic Factor

Perkins[1] and Whitehouse[2] have shown how chromosome centromeres can be mapped by the analysis of unordered tetrads of spores (or gametes), provided segregation is occurring at three unlinked loci. The basis of the method is the determination of the frequency of tetratype tetrads for the loci considered in pairs. If at one of the three loci there is segregation for a lethal or other epistatic factor, the frequency of tetratype tetrads with respect to the other two loci will be indeterminable. Nevertheless, it is still possible to map the genes in relation to their centromeres.

Consider first the general case of tetrads segregating for three pairs of unlinked genes, *A* and *a*, *B* and *b* and *C* and *c*. Five classes of tetrads can be recognized :

Class	Genotype of tetrad	Ditype (*D*) or tetratype (*T*): *A* and *B*	*A* and *C*	*B* and *C*
I	*ABC abc ABC abc* *ABc abC ABc abC* *AbC aBc AbC aBc* *Abc aBC Abc aBC*	*D*	*D*	*D*
II	*ABc abC ABC abc* *Abc aBC AbC aBc*	*D*	*T*	*T*
III	*ABC abc AbC aBc* *ABc abC Abc aBC*	*T*	*D*	*T*
IV	*ABC abc Abc aBC* *ABc abC AbC aBc*	*T*	*T*	*D*
V	*ABc abc AbC aBC* *ABC abC Abc aBc*	*T*	*T*	*T*

Tetrads of class I are ditype with respect to all three combinations of the loci in pairs. As indicated, there are four possible constitutions for this type of