

The department has conducted a number of tests (fig. 188) on the effect of various amounts of protein from dried skim milk and from high-grade meat meal both on growth of chicks and on egg production. The best growth and the lowest feed consumption per pound of gain in young chicks was obtained in the dried-milk rations containing from 13.9 to 17.5 per cent of protein, and in the meat-meal rations containing from 19.5 to 21.5 per cent protein. The best results with laying

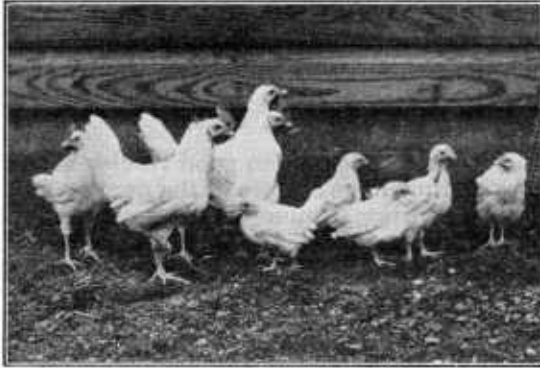


FIGURE 188.—Two groups of chickens of the same age; the larger chickens received plenty of protein, whereas the smaller ones were fed a low-protein ration.

hens were obtained from the skim-milk rations containing about 15 per cent protein and from the meat-meal rations containing about 20 per cent protein. The best amount of protein to use in a ration from one product does not necessarily represent the best amount of protein from other products. These rations consisted only of corn meal and minerals with either meat meal or dried milk, and just

as good growth and egg production were obtained on less protein from rations which contained a greater variety of proteins and of other feeds.

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## POULTRY'S Mineral Requirements Vary at Different Ages

The inorganic compounds required by a growing chick, a laying pullet, and a hen are the same in kind but quite different in quantity. In other words, the mineral requirements of chickens vary with age. So long as a chick is actively growing, the inorganic materials required are chiefly those which are used in the formation of bone. Elements other than those commonly found in bone are necessary but the amounts are relatively small. Therefore, by far the greater part of the inorganic material required by the growing chick is calcium and phosphorus. In addition, the chick needs at least some sodium, potassium, magnesium, chlorine, iodine, fluorine, iron, sulphur, and silicon; also, possibly, some manganese, copper, and zinc. Just what other elements may be needed, except, of course, carbon, hydrogen, oxygen, and nitrogen, are not definitely known.

### Sources of Calcium and Phosphorus

Usually sufficient amounts of all the elements except calcium, and occasionally phosphorus, are present in the feed. To insure an adequate supply of these two elements some source of calcium phosphate may be added to the ration. The best source of calcium and phosphorus, at the present time, is undoubtedly some form of bone or bone ash. If raw phosphate rock is used, it should not contain more than the very smallest traces of fluorine. When the feed consumed by the chicks contains a sufficient amount of phosphorus but not enough calcium, the latter may be supplied by adding calcium carbonate, in

the form of either oyster shells or natural limestone. If limestone is used, it should not contain more than 1 or 2 per cent of magnesium compounds; the less magnesium the better.

When the calcium and phosphorus in a ration that is being fed to growing chicks are not in the proper proportions, a condition known as rickets may result, especially if the chicks receive but little direct sunlight. The effects produced by feeding such a ration may be corrected by adding a small amount of cod-liver oil to the feed. Since the efficacy of cod-liver oil, for this purpose, is due to its vitamin D content, only oils tested biologically for that vitamin should be used.

### Caution in Use of Salt

A possible deficiency of sodium and chlorine may be guarded against easily by adding a small amount of ordinary salt to the feed. Although many of the published rations contain as much as 1 per cent of added salt, it is quite probable that 0.5 per cent is enough. The salt should always be well mixed with the feed because when it is fed alone it is appreciably toxic; as little as one-quarter of an ounce has been known to be fatal.

In the so-called goiterous sections of the country where the water and soil contain extremely small amounts of iodine, the ordinary salt used in compounding the ration should be replaced by "iodized" salt.

Although the need of growing chicks for mineral substances has been pointed out, there is also the possibility of feeding too much mineral matter. In such cases the growth of the chicks is usually very poor and uneven. When the feed contains as much as 5 or 6 per cent of total ash it is doubtful whether further additions are of value, especially if the constituents of the ash are reasonably well balanced to begin with.

When a pullet begins laying she is usually still growing, although the rate of growth is relatively much less than it has been. For that reason she still needs some calcium and phosphorus for growth. As soon as egg production begins the pullet requires relatively large amounts of calcium for the formation of eggshells. This additional requirement of calcium probably is best supplied in the form of oyster shells or limestone.

### Effect of Feed on Shell Texture

As the pullet approaches full body maturity her need of calcium and phosphorus for growth becomes less and less but the amount of calcium required for eggshells is still great and is roughly proportional to the number of eggs produced. This being so, it is perhaps best to feed the mature hen somewhat less calcium phosphate than is fed to the growing, but egg-producing, pullet.

When the amount of available calcium in the feed of the egg-producing chicken is insufficient, a decrease in egg production usually follows and at the same time there is a tendency for the shells of the eggs to become thinner and poorer in texture. As soon as the amount of available calcium in the feed is increased there is a marked tendency for the shells to approach normal thickness and texture. Just because there is an abundance of calcium compounds in the feed, it does not follow that the chicken has at its disposal sufficient available calcium for the formation of eggshells, because the various compounds of calcium are not equally assimilated. Of the several calcium com-

pounds usually fed to the egg-producing chicken, calcium carbonate is one of the most suitable.

So far as it is now known it is not likely that a poultry ration will be deficient in iron, magnesium, potassium, fluorine, or silicon, but there is a possibility of sulphur deficiency.

### Varying Need of Chickens for Sulphur

Sulphur is an important constituent of feathers and eggs. Since feather growth is slower in chicks than in molting hens and since an appreciable amount of sulphur is found in eggs, the ration of the molting or egg-producing chicken is more likely to be deficient in sulphur than is the ration of the growing chick. Experiments conducted at the United States Animal Husbandry Experiment Farm, Beltsville, Md., have shown that the annual egg production of pullets and hens may be appreciably increased by feeding certain inorganic compounds of sulphur.

The practical significance of the foregoing information may be summarized as follows. The inorganic materials required by the growing chick are chiefly those used for bone formation, particularly calcium and phosphorus. Any form of bone or bone ash is a good source of calcium and phosphorus. Under certain conditions there may be a deficiency of calcium, phosphorus, sodium, chlorine, or iodine. If the calcium alone is insufficient more calcium carbonate, such as crushed oyster shells or ground limestone, should be fed. To guard against a deficiency of sodium and chlorine, small amounts of salt may be added to the ration; and in the so-called goiterous regions "iodized" salt is recommended. When producing eggs chickens require a large amount of calcium for the eggshells; this probably is best supplied by calcium carbonate. Sulphur is required for feather growth and egg production and at times the ration fed may be deficient in this element unless sulphur compounds are supplied.

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### **P**RODUCE Agency Act Protects Consignor in Interstate Trade

When a farmer consigns his produce to a market to be sold for him on commission he must rely on the consignee to look after his interests faithfully in obtaining as large returns as possible. The consignee commission merchant becomes his agent or personal representative.

Many safeguards are available to a shipper to protect him against receiving unsatisfactory returns. Some are improved business practices, others are provided by the Government through recent legislation.

High quotations do not insure high returns. Before consigning, the shipper should investigate the reputation of the prospective consignee by consulting a rating book of produce dealers or by having his banker inquire as to the dealer's standing.

Reliable information can be obtained daily, without charge, from the United States Department of Agriculture as to movement, market prices, and demand for fruits and vegetables. This information, published in market news reports issued at Washington and at branch offices throughout the country, will aid the shipper in consigning his produce to the best advantage.

In case a dealer in a market undertakes to refuse a car which has been sold to him, and offers to handle the car for the shipper's account,