POULTRY.

The Value of Mineral Elements in Poultry Feeding.

EDITOR "THE FARMER'S ADVOCATE":

Observations from practice in poultry feeding give the general impression that the quantity of mineral matter supplied to fowls should be sufficiently large, but little attention has been given to its composition.

All foods do not contain the fourteen elements, from which the animal-body is constructed, in amounts sufficient to sustain growth, and it is recognized that deficiencies in the amount and kinds of nutriment available may affect not only the size but also the character of the growth of animals. On the other hand, there is a prevalent idea that the mineral nutrients are present in all foods in excessive amounts and that therefore, the study of this matter is not of great practical importance. The fallacy of such an assumption is clearly borne out by experimental data at hand, although detailed information with reference to mineral nutrients in poultry feeding, in particular, is limited. Available results of such work are obtained from Ingle in England and South Africa, Laurie in Australia, Wheeler and Bolté in the United States. Valuable comparative data is obtained from the investigations of Forbes of the Ohio Experiment Station (U. S.)

Concerning feeding practice it may be said that there is no particular relationship between the compounds of the ash and the compounds in which the elements occur in plants and animals. But with this particular phase we are not chiefly concerned, since our object is to determine the mineral requirements for specific purposes.

Mineral Elements in the Fowl's Body.

Calcium appears abundantly in the form of calcium oxide (Ca0); three-fourths of the ash of the body is lime and seven-eights of the ash of bones is phosphate of lime. The presence in the body of calcium salts is necessary to muscular contraction.

Phosphorus occurs in a number of forms; inorganic phosphates, which occur throughout the body in solution in its fluids and also in the solid substance of the bones; lecithins which are found in all plant and animal cells; phosphoproteins and nucleoproteins. In the inorganic phosphates phosphorus is present as salts of the mineral basis, calcium, magnesium, potassium and iron. These are readily digested and assimilated and may be retained in the body and used for the various functions. Three-fourths of the mineral matter of the body is inorganic calcium phosphate.

Iron is one of the least abundant though most important elements in the body. Without iron the blood cannot carry oxygen.

Sodium is present principally as chloride, common salt, (NaC1.) but also as the phosphate and carbonate. Sodium salts are essential to cardiac relaxation. Without sodium and calcium salts, the heart is unable to function at all.

Potassium is present mostly as salts of mineral acids.

Magnesium, mostly as the phosphate, is found in small quantities in the bones.

Sulphur is an essential constituent of all of the proteins of the body.

The Functions of the Mineral Elements.

When we consider that the mineral elements in the body are most of them strongly acid or basic, we know that their compounds have a tendency to become excendingly active when in dilute solution. Thus, through their particular attributes the mineral elements maintain a very important relation to practically all the vital processes and they enter into the composition of every tissue and fluid of the body.

In considering the constructive purposes of the mineral elements we note that calcium, phosphorus, sulphur and iron are used in the formation of the essential structures in the body. Iron, also, through its affinity for oxygen, becomes a carrier of gaseous products and functions in the liberation of energy. Sulphur and phosphorus contained in proteid substances give rise to sulphuric and phosphoric acids and these acids are neutralized through the equilibrium existing in the blood between the alkali carbonates and the phosphates. Again the activity of enzymes, which function in building up and tearing down chemical compounds in the animal body, requires certain degrees of acidity or alkalinity which are maintained through the presence of mineral salts. "The control of both voluntary and involuntary muscles is accomplished through the proportion of calcium, magnesium, sodium and potassium salts acting upon them". Other functions of mineral salts are to serve in the movement of liquids throughout the body and its tissues, to facilitate vital processes involving the proteids, and to keep certain nitrogenous constituents, in solution, in the liquids of the body. Calcium in the blood is essential to its coagulation, and mineral chlorides furnish the chlorine of the hydrochloric acid in the gastric juice, pepsin being inactive except in the presence of hydrochloric acid.

The Mineral Elements must be Properly Balanced.

It will be noted at once what a variety of functions the mineral elements serve in nutrition and it is also interesting to note the effects of lack of mineral nutrients. From Forbes we learn that Forster, a German physiologist, first proved that animals can live but a few days on food that is practically free from mineral matter, and, strangely, "that animals will live longer if given no food at all". In considering the possible causes of the deficiency of mineral matter—chiefly phosphate of lime—in the bones of animals suffering from a peculiar bone disease (osteoporis) Ingle was led to attribute its prevalence in South Africa to the peculiar diet used for working animals in that country—a diet composed often entirely of oat-hay or oat-hay and maize grain. Both of these foods are characterized by containing a high proportion of phosphoric acid and a low proportion of lime in their proportion of phosphoric acid and a low proportion of lime in their ash. In experimenting with rations to overcome the conditions resulting from continued feeding of oat hay, Ingle prepared a diet to which he added various mineral salts and which gave very beneficial results. His work with horses led to further work with poultry.

In regard to the erroneous assumption that it is the amount and not the composition of the ash constituents that is important in bone formation, the feeding of bran to chicks may be taken as an excellent example. Bran is rich in ash and on this account it has been extolled as being peculiarly well fitted for bone formation. It contains, as a matter of fact, about 3.3% phosphorus pentoxide (P 05) and only about 0.3% lime and is therefore not especially suitable for the promotion of bone formation.

The results of the analyses of Lawes and Gilbert of the whole carcasses of various farm animals show that the total lime present exceeds the total phosphoric acid. In bones of animals the ration is about 100 of phosphoric acid to 150 of lime. Seeds of all kinds contain far more phosphoric acid than lime though many contain considerable quantities of magnesia; there is always a preponderance of phosphoric acid. Stems and leaves of plants, as a rule, contain a preponderance of lime. If, as we have reason to believe, animals require for healthy bone formation and renewal, lime and phosphoric acid in approximately equal proportions, it is evident that a diet composed exclusively of the grains is not adapted to supply their needs and cannot be used, for long, without injury to health. From a consideration of these facts it appears possible that the value of green food or substitutes may depend chiefly upon the lime content.

Mineral Supplements to the Diet.

Some years ago Ingle devised a preparation intended to be administered along with the usual food, adapted to ensure that the animals, so fed, should receive adequate supplies of all the necessary mineral constituents which might be lacking in their ordinary rations. This prescription he supplied to several correspondents in South Africa, and whenever tried the preparation proved very beneficial in preventing ill-health in poultry kept in confinement. In England and America where greater variety of food is usually available, the need for the preparation is perhaps not so great, but even with poultry kept under the best conditions it has produced under careful experimental conditions, a decided increase in the rate of growth of young poultry.

An interesting and suggestive contribution to the study of this question is given in experiments undertaken at the College Farm, Theale, England, under Edward Brown, late of the College Farm and at present President of the International Association of Instructors and investigators in Poultry Husbandry. Experiments were conducted with a preparation of mineral salts prepared by Ingle as follows: Common salt, 30 parts; phosphate of soda, 9; calcium fluoride, 1; ferrous sulphate, 1; bone ash, 30; chalk, 14; Epson salts, 10; charcoal, 2 and flowers of sulphur 3 parts, making 100 parts in all. Two lots of White Wyandotte chickens, besides others, were fed from birth in exactly the same way, excepting that one pen received a small quantity of the "mineral food", while the other did not. At eleven weeks old the nine chickens in the former pen weighed 18 lbs., or an average of 28 oz., the twelve chicks in the latter pen weighed 17 lbs., 2 oz., or an average of 20 oz. Remembering that the chicks were all fed in the manner usual at Theale—i.e., doubtless upon a varied diet—these results afford strong evidence of the usefulness of the "mineral food," for had the diet been composed of only one or two items, as is often the case with chickens in confinement, there can be little doubt that without this addition the growth would have been less than it was and the advantage correspondingly greater. Trials of laying hens, with a grass run, carried out by Edward Brown showed little or no effect so far as number or weight of eggs produced was concerned, but the birds receiving the mineral food came to lay more quickly, but whether this result was due to the mineral food or to other causes cannot be stated. In other trials, carried out by F. Parton, Poultry Expert of the Leeds University, it was noticed that with pullets the mineral food induced the growth of larger combs, and that with Leghorns the combs of the pullets receiving the preparation grew perfectly erect instead of pendulous, as is usually the case.

In experiments to determine the source of material for the egg shell, Wheeler at the New York Experiment Station found that lime in the egg shell was largely derived from the calcium of oyster shell fed in a test comparing oyster shells with broken glass.

Wheeler found that most grain rations for growing chicks were improved by the addition of bone ash. Oyster-shell was found to be less valuable than bone ash and rock phosphate.

Growing chicks need calcium phosphate as a mineral supplement to the grain rations. Laying hens need calcium carbonate as a mineral supplement to the grain rations; egg shells are high in percentage of calcium since they are almost pure calcium carbonate.

In conclusion it may be observed that comparatively little has been done to determine specifically the value of mineral elements in poultry feeding, and yet, notwithstanding this, the available data shows conclusively that mineral elements are essential for the functioning of the vital processes as well as for the development of bone and eggs. It is clearly essential, then, that definite work should be undertaken to determine the most economical methods of supplying the required mineral salts in specific rations.

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Prevent the Birds Contracting Colds.

The loss to poultrymen occasioned by catarrh, colds and roup amounts to a good deal during the fall and winter months. The damp cold weather in early fall causes an outbreak in flocks which are not properly nourished and housed. Roup in particular is infectious and spreads from one bird to another, consequently it is not unusual to see the majority of some flocks infected with the disease. Catarrh is non-contagious and may only affect a few birds and this trouble is caused largely by exposure to cold and drafts. Weak stock will be attacked before strong, vigorous birds. When symptoms of colds are seen in the individuals of the flock, treatment should be administered to prevent the trouble developing into that more fatal disease known as roup. The secretion should be removed from the mouth and nostrils and then warm water used to cleanse them. Potassium permanganate, two-per-cent solution, or a two-per-cent. solution of boracic acid may be used for disinfecting the air passages and eyes. Roup is a contagious catarrh and attacks the membranes of the eye, the nostrils, larynx and trachea. The symptoms of the disease are known to most poultrymen. There is usually a fever and a dullness in the birds, and a thin, watery discharge from the nasal opening which after two or three days may become thick and obstruct the breathing. The eyelids become swollen and completely closed in time. The birds sneeze in an effort to dislodge the secretion from the air passages. They have no appetite and sit around with their heads drawn into the body. As a rule roup does not kill quickly, the course of the disease is of long duration. It is often noticed that affected birds will appear better for a few days and then become worse. It is claimed that roup will remain in the flock for a number of years and cold and dampness will so aggravate it as to bring pronounced symptoms. The disease is not nearly so common in spring and summer as it is in the fall and winter. The following mode of dealing with the disease is given in "Diseases of Poultry," by Pearl, Surface and Curtis: "The best treatment is prevention. The disease can be prevented by stopping of infection. In introducing new birds always procure them from uninfected flocks. Isolate all new birds and all birds which have been exhibited at shows, for two or three weeks, to make sure that they do not develop the disease. Exclude from uninfected house and yard poultry and all animals coming from those which are infected. Do not use implements that have been used on infected premises. Keep the birds in a good hygienic condition, well nourished and in dry, well-ventilated houses and roomy yards. If the disease has been introduced into the flock, immediately separate from the flock any birds which show symptoms. Disinfect the yards and houses and follow with a whitewash. Use potassium permanganate in the drinking water. Burn or bury all birds that die. Medical treatment is as follows: If the eyes and nostrils are attacked they have to be carefully washed at least twice a day with an antiseptic solution such as two per cent. boracic acid in a decoction of chamomile flowers, or one-half per cent. solution of corrosive sublimate. This kills the organisms. The use of one to two per cent. of permanganate of potash has given good results. The nostrils are pressed between thumb and forefinger in the direction of the beak. This helps to loosen the discharge in the nostrils. The bird's head is then plunged into a solution of permanganate for twenty or thirty seconds. When solid tumors occur on the eyelids, they should be opened and the cheesy matter removed, then the surrounding membrane touched with a five-per-cent. carbolic acid solution."

Treatment requires a lot of time and patience, consequently every means should be adopted to prevent infection. No poultryman can afford to have half or even a quarter of his flock used up by this disease for a portion of the winter when eggs are high in price. Poultry must be attended to if results are to be obtained. Better to dispose of the flock than have the birds sickly and non-productive the greater portion of the time.

HORTICULTURE.

Some Good Things.

EDITOR "THE FARMER'S ADVOCATE":

With the season's garden operations fresh in mind, now is the time to dig out a few nuggets of experience of value in planning future work. Some crop may fail to make good any year, but one can always count on a harvest of information. Like charity, it never faileth. The best garden book is the plot and what grows in it. There is something worth while to be learned from every day's page.

Potato Seed Trial.—At the rate potatoes have rotted in some patches, the owners will do well to conserve seed tubers for next spring. The question is whether to eat the small ones or the big ones, or to dig out the eyes to plant and eat the rest. A Michigan seed catalogue offering eyes for sale led me to make a trial on my own account in three rows. In No. 1 row I planted three healthy eyes gouged out of good, large potatoes; in