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(THE JOURNAL OF THE ALL-INDIA VETERINARY ASSOCIATION)

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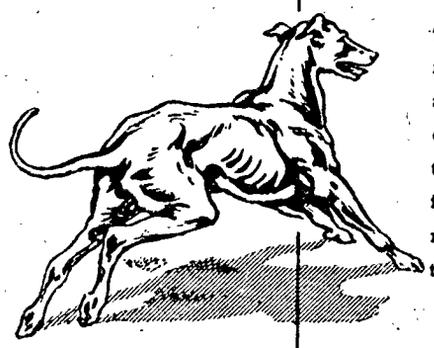

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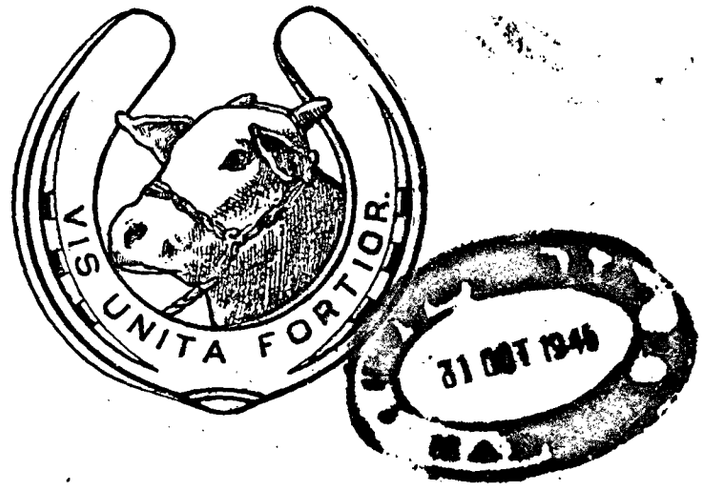

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Indian Veterinary Journal

(*The Journal of The All-India Veterinary Association*)

Vol. XXII SEPTEMBER, 1945 No. 2

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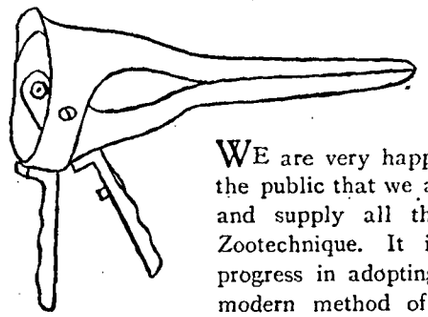

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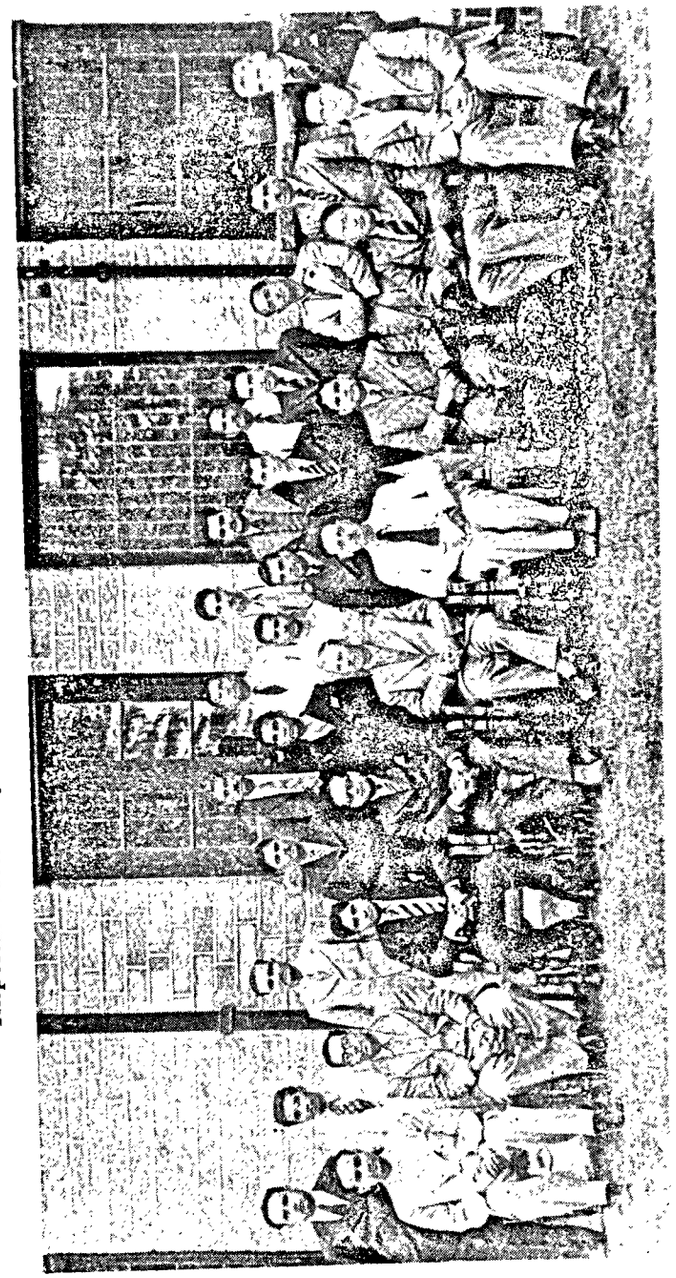

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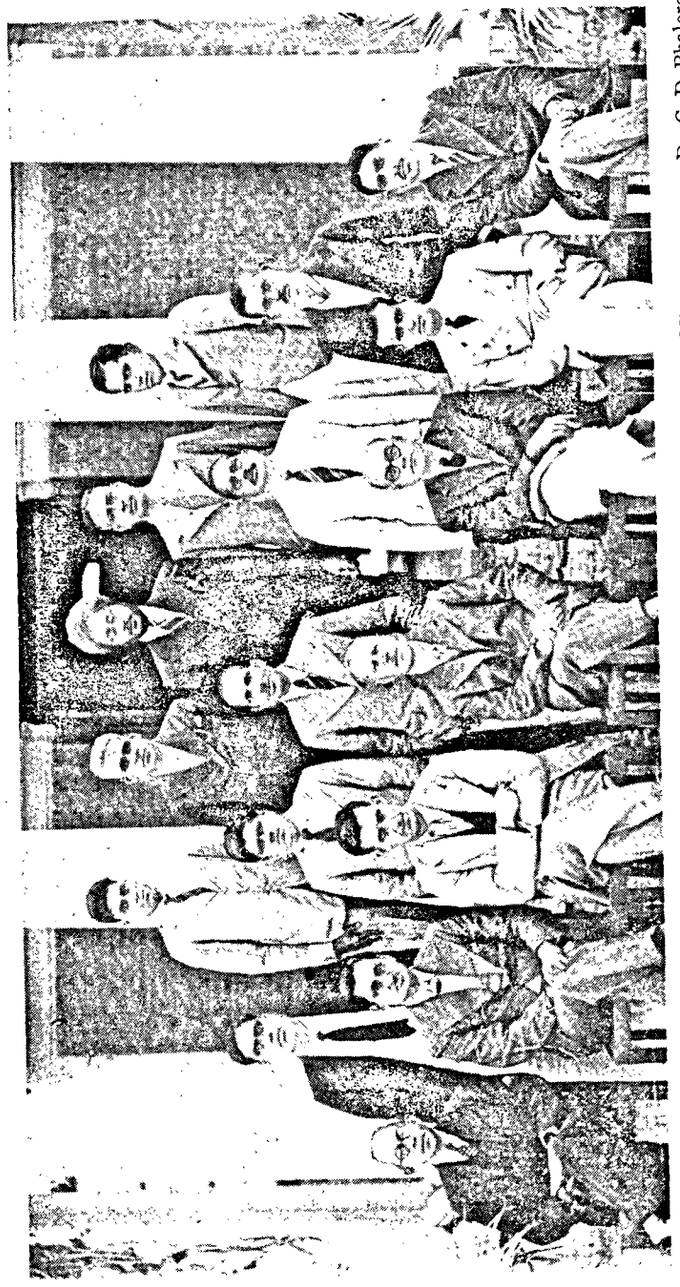

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SPECIAL POULTRY NUMBER

THE

Indian Veterinary Journal

(The Journal of The All-India Veterinary Association)

Vol. XXII SEPTEMBER, 1945 No. 2

General Articles

THE FUTURE OF INDIAN POULTRY INDUSTRY

By

G. WILLIAMSON, O.B.E., M.R.C.V.S., D.V.S.M.,

Animal Husbandry Commissioner with the Government of India, New Delhi.

Within the last few years grim necessity has ordained that most countries of the world should take stock of their food resources, should size up their necessities and their potentialities, and should decide upon the most economical method of making the one fit the other. The necessity of doing that was not brought home to India as soon as it had been to many other countries but with famine within her borders, an unusual strain thrown upon her resources by the maintenance of immense armies, and with the authoritative pronouncement of the Hot Springs Conference, the necessity of a re-orientation of policy and reorganisation of practice was realised with painful clearness. The first stimulus would by itself doubtless have given rise to a reaction similar in every respect to that of former occasions—immediate improvisation of no permanent character, to tide the emergency, the second combined with the first, appealing as it did with a promise of a fairly prolonged and undoubtedly lucrative return to the producer, encouraged a reaction which very largely controls the situation now, while the third, pointing to the moral obligation of nations and their governments to assure a proper diet for every one, has set action agoing the effect of which must be as permanent as any that mortal effort is capable of. It would have been astonishing if this effort to obtain food in plenty and of the right sort had left the poultry industry in India unaffected. While in the extremity of famine, poultry and poultry products must of necessity be looked upon as an unobtainable luxury, in the feeding of a fighting army and the adequate nourishment of a healthy population, however, the contribution of the poultry industry is just one of the essential sources of high quality food.

It would be profitable, then, to try to figure out just how poultry produce ranks with other food commodities in the nation's larder and to see how it ought to be treated in relation to them so that it can make its maximum contribution.

The Indian poultry keeper, if we speak in general terms, was, and is, drawn from the poorest classes of agricultural society. Individuals or families possess but a few birds. The birds obtain their sustenance by their own efforts. No food is allotted to them and no expense is incurred on their behalf and thus everything they produce from faecal excreta to eggs and flesh goes to the owner as net profit and he is in a position to dispose of them at any rate of exchange which may be forthcoming and still be up on the deal. That, along with his extreme poverty, his chronic need for cash, his ability to make do on a very small income and, in some cases, the restricted market of a poor clientele, have induced him to take what comes in the way of prices, to make no real effort to increase output or to pay anything but the slightest attention to improving its quality. Each attempt at individual enterprise has been smothered by the complacency of his fellows, for enterprise involves expense and that the pioneer is unable to recoup in a market where goods are sold at rock-bottom prices. Even an effort to maintain a larger head of stock implies a certain degree of hand-feeding to say nothing of the possibility of the extra demands which any appearance of improved circumstances might evoke from the poultry owner's creditors and others with whom he is directly or indirectly involved.

That, we believe, is approximately the position in which the Indian poultry keeper was situated before the war brought with it a phenomenal demand for eggs and poultry meat. The changed position was for some time not appreciated by the producer nor considered by the consumer and the middleman reaped the profit. As supplies shortened, however, some of the improvements in the market gradually trickled back to the producer, who, exulting in the increase of his income without any corresponding call on his commitments, quickly parted with every egg he could obtain and every chicken he could spare. The demand was unsatisfied and supplies eventually contracted, prices soared, and now the unthinking producer parted not only with what he could spare but with such a considerable amount of his capital stock that the country's resources were severely depleted. The chief consumer, that is the armed forces, now realising the position organised its practically unbounded resources to obtain its requirements, as far as possible by its own efforts. It established poultry farms on the western model and on a scale somewhat commensurate with its needs, and at the same time co-operated with the civil authorities who also had become aware of their responsibilities, to help the small producer to regain his stock and to encourage others to take up poultry keeping, by guaranteeing a paying market, by organising it, by improving the quality of

the stock and by protecting it as far as possible from the disease hazard. That is the position in which we find the industry today. In some places the result of organised effort is already apparent, in others it has still not developed and in yet other districts, for one reason or another, the effort has still to be made. It is the accepted policy for the time being that the immediate requirements of the armed forces and the urgent needs of the priority communities are to be met at any cost within reason, but, as the situation improves and as the abnormal conditions dissolve, what place is the poultry industry likely to hold in the framework of the country's final food policy ? The answer to that can be found only if we can make a true estimate of where eggs, and possible poultry meat, can most economically enter into the diet of the Indian people.

The first call in human nutrition, without doubt, is for energy producing foods, which, in India can be translated by the term "cereals" of which it has been estimated there are 49 million tons available today. The next is to supplement the protein these cereals carry by a sufficient quantity of other proteins so as to make that supply adequate for full bodily vigour. Then comes the necessity of completing these with the supplementary foods without which the others are not fully utilised nor can robust health be maintained. As there is no surplus of cereal food in the country, but, in fact, an actual shortage even for the amount required for direct consumption, a shortage which doubtless will be made good in time but which is not likely to be made good to the extent that cereals can be liberally used in any other way, the first necessity is to ensure that what cereals there may be, are used in the most economic manner. When considering the necessary supplements to them the primary aim must thus be to give priority to those whose production impinges least upon the supply of cereals. Various classes of plant protein can be cultivated without in any way restricting cereal supply and in fact their cultivation actually promotes cereal growth, such proteins however do not by any means meet the full requirements of man and thus one has to turn to other sources, that is those obtained from animals. All animal protein, however, being primarily derived from the soil through the vegetable kingdom, it is necessary to decide which form can be obtained with the least embarrassment to the supply of the essential cereals, or, in other words, which domestic animals compete least with humans in their food requirements. The obvious answer is, those which can obtain most of their essentials from material not used for human food Judged by that simple standard, there would be no difficulty in deciding which of our domestic animals should receive priority of treatment, but in a thickly populated country another difficulty arises, for if there is to be no competition in the nature of food consumed, there must be no competition in the requirements of land upon which the food is to grow. The fibrous, relatively bulky material upon which cattle for instance, can not only exist but can thrive takes up

space upon which human need presses. Moreover, upon such food the production capacity of the cow is limited thus it is necessary to keep more cows using more space if they are supported entirely upon food non-edible to humans and thus even that class of animal competes, although indirectly, with man. For that reason alone, if for no other, what has ultimately to be decided, is what class of animal will give the highest return for any share it is given in human foods? When making that computation, especially in India, it is unnecessary to consider domestic animals as sources of energy nutrients, their primary use to us is as a source of protein and supplementary foods. The relative efficience of domestic animals as estimated by Halnan in the United Kingdom, taking into consideration the breeding and rearing of stock and their production capacity, shows that the dairy cow, measured as milk in three lactations, has a protein conversion efficiency of 17·0 per cent; that of poultry, measured in eggs produced in 2 years of life is 33·1 per cent and measured as poultry meat, grown to 3½ lbs., is 18 per cent. That estimate is based upon United Kingdom systems of farming and is certainly not strictly applicable to India nor has it been taken as scientifically accurate even in the United Kingdom, but it is equally certain that it does indicate that even hand-fed poultry, in providing eggs for human consumption, are one of the most efficient producers of animal protein that there is. The free ranging village birds which obtain much of their protein food, in the shape of insects, and of their other nutritional needs, from fallen grains and food which have been damaged or dropped from the human supply and which can he used by none of the other domesticated animals, must surely be the most economic protein converters in India. The number that can be maintained in that way, however, is limited and their output is curtailed. There is reason to assume moreover that the pre-war head of poultry, which for all practical purposes solely existed upon that source of food, was just about the most that could be carried on it, and that if the egg output of the country is to be increased, recourse must be had to direct hand feeding. Whether they are fed, however, on otherwise unconsumable waste or are given a share in the country's cereals, they will at least make as good a contribution to the country's nutritional needs as any agent we have.

Is it necessary or desirable to increase the output of eggs in normal times? For an answer to that question we may turn to the deliberated opinion of the experts of the sub-committee of the Nutrition Advisory Committee of the Indian Research Fund Association expressed last year, who state that it would be desirable for India to produce 102,000 million eggs per annum for internal consumption alone. They admit, however, that that may be outside the range of practical possibilities: as it would mean more than a thirty-fold increase on the amount at present produced, we may perhaps agree with them. A more modest target, say a five-fold increase would be big enough even for a long range policy. It would mean a production of roughly 15,000 million eggs per annum.

Such an expansion can be made in two ways, first by increasing the efficiency of the birds which use the village waste products, and secondly by increasing the number of birds which are to be kept under the hand-feeding system and using only those of the highest laying strains. In the first category, judged by what knowledge is available and that, it must be admitted, is by no means complete, the improvement should be carried out by supplanting the present stock with breeds whose laying capacity is more fully developed. It is known that certain breeds will give more eggs for a certain amount of food than others. It is assumed that that applies to birds on a restricted diet as truly as it does to those on an adequate one but the assumption that it applies to foraging birds in the village has yet to be verified. If, however, the supply of food obtained by foraging is supplemented by about 1 oz. of cereals per bird per day, it is probable that the improved breeds will give better return than the ordinary village stock. For the second category there is indisputable evidence that the most economic method in the long run is to maintain only the highest producers and feed them on the best food. That in practice means intensive husbandry with all the over-head charges which such a system entails. If the supply of eggs is to approximate the number which we have provisionally suggested as a target, at least two conditions must be fulfilled: the first is that the requisite amount of cereals, most or all of which it must be admitted can be directly used in the human diet, should be surrendered for egg and poultry production and secondly that this production must be profitable to the producers.

The fulfilment of the first condition does not lie in the hands of the producer but the responsibility for making the second condition possible is his, at least partially; it must be seen to, for instance, that his stock is the best that can be maintained under his system of management. It has already been stated that the number of birds that can be maintained in a village on foraging alone is probably not more than the pre-war all India average figure of 286, including 100 layers. If the most economical stock is to be maintained there in future, they must consist of either pure improved breeds, half-breds or the best selected *desi* stock. By that means alone and with a supplementary ration of about 1 oz. of cereals per day per bird the present output of about 3,000 million eggs per annum may possibly be doubled. All increased egg production above that must come from hens which are kept under a greater or lesser degree of intensive husbandry and which would require some 3 oz. of cereals in one form or another each day but which could be counted upon to give an average of 144 eggs per bird per annum. On that basis the amount of cereals which must be reserved for poultry can be computed—in the villages 6,000 million eggs would be produced by 60 million birds getting 1 oz. of cereals each per day which is 0·6 million tons per annum. To that food must be added sufficient to maintain the growing stock for replacement, bringing the total required

to 1 million tons. The other 9,000 million eggs would be produced by 62·5 million birds getting 3 ozs. of cereals per day which is equivalent to 1·9 million tons of cereals, and taking the replacement stock into consideration, a total of 3·1 million tons will be needed. The grand total of cereals thus required would be 4·1 million tons which would give a return of 0·84 million tons of eggs and 0·25 million tons of poultry meat or a total return of 1·09 million tons of protein food, the expenditure being at the rate of 3·8 cereal units to produce one unit of protein food. If, however, we must be content with increasing the egg production by merely 100 per cent, our efforts should be confined to the village where for an expenditure of 1 million tons of cereals we may get a return of 0·34 million tons of eggs and 0·06 million tons of poultry meat, or a total of 0·40 million tons of protein food for an outlay of 1 million tons of cereals, an expenditure of 2·5 cereals units for one unit of protein food.

From the producer's point of view any increase above the 100 per cent mark involves a considerable outlay of capital and a certain recurring cost, and thus, in the ordinary course of commerce, the amount of poultry produce which is eventually forthcoming will depend upon how many people can afford to pay a price for it which will make its production a profitable undertaking. Such a consideration emphasises the fact that poultry produce will enter into the diet of the ordinary man just in proportion as his income rises to meet the cost. As soon as the demand for eggs and poultry outstrips the amount supplied by the foraging hen, an increase in price follows and it then becomes profitable to hand feed the forager and to keep more of them. More eggs and poultry meat are produced. If the demand still increases or remains unsatisfied and a further rise in price results, then the intensive system of production becomes economical. To-day the specialised poultry farmer may flourish; it is the doubt that he can obtain even a moderate income to-morrow that stems all initiative in that direction. There does seem, however, good scope for enterprise for him in the normal heavy, and as yet unsatisfied, demand from prosperous urban areas for poultry produce of first class quality. That demand is likely to increase in the future rather than diminish and as it can never be satisfied by eggs which have lost the first bloom of freshness or by poultry meat which is neither tender nor succulent, a market is assured for the producer with a favourably placed farm who can make use of the food by-products of the town to rear his stock on the most economic intensive system of husbandry. He cannot hope to monopolise the urban market but he can cater without opposition from the other classes of producers, for the specialised demand for superior products and he can enter more and more into competition in the open market as the level of income rises throughout the country and as the number of consumers increase. He will never be a menace to the village producer, however, for the latter

having all the advantages on his side, is in a position to undersell him whenever he finds it necessary. It was doubtless these considerations which gave rise to the recommendation made at the last meeting of the Animal Husbandry Wing of the Board of Agriculture in February 1945, namely, "that the Poultry Industry in India should be developed on the following lines:—(*a*) in the vicinity of the important centres, large commercial units should be encouraged; and (*b*) in other areas, a poultry cottage industry should be developed. In the former case encouragement should be given to private effort by facilitating the provision of equipment and feeding stuffs; in the latter case, the producer should be assisted in obtaining improved stock and should be instructed in management; the producers should be organised for marketing in order that the produce can be quickly transferred to the consumer so as to avoid loss."

It thus seems apparent that if the egg supply of the country is to be materially increased, it can be done only if about 4·1 million tons of cereals are reserved for the purpose. If the supply is only to be doubled, it can be done at a disproportionately less cost of cereals. In any event, increased egg production means less cereals for human consumption. There is every reason to believe, however, that poultry will give a better return for the food they receive than any other domestic animal except the cow. The village free range poultry keeper should be encouraged to the limit of his capacity. Commercially the intensive system of poultry farming can be followed in urban areas to meet a specialised demand for poultry produce of superior quality.

SOME COMMON INDIAN BREEDS OF POULTRY *

By

R. L. Kaura, B.V.Sc., M.R.C.V.S,

Deputy Director of Veterinary Services, Orissa

Poultry raising is an important cottage industry in India and is almost entirely restricted to certain communities and the poorer classes. Properly carried out, it should provide them with a substantial source of income to help maintain themselves. Both the initial expenditure of a small poultry farm and the recurrent cost of maintenance of birds etc. are rather low and within the reach of an ordinary cultivator. The birds will utilize house waste, unclaimed grains from the threshing yards, street sweepings, dairy waste, *e.g.* whey, buttermilk etc. and convert them into flesh and eggs. While the cultivator is busy in the field his wife and children can look after the birds, their feeding and management.

* Reprinted from "*Indian Farming*" Vol. VI. No. 1.

India produces every year about 33,648 lakhs of eggs and the total income from this industry is Rs. 5¼ crores, excluding the loss of Rs. 57 lakhs due to mishandling and improper methods of marketing. The value of birds themselves is estimated at about Rs. 7½ crores. Hens represent about 90 per cent of the total number of laying birds in India and ducks the remaining 10 per cent. Although it is commonly thought that the Indian producers keep poultry largely for their own use, yet more than 60 per cent of the hen eggs and 80 per cent of the duck eggs find their way to the market. Poultry thus provide a considerable amount of cash income to a very large number of village producers throughout the country and development of this industry in India would not only greatly improve the economic condition of the most needy and poorest villagers but augment the food supply with materials of good nutritive quality.

There is considerable scope for the improvement of egg-laying capacity and the size of eggs of the indigenous poultry, which on account of natural selection, are comparatively more resistant than the imported breeds to unfavourable climatic conditions and diseases. There are immense possibilities for the development of an export trade from India of fresh eggs and egg products such as frozen, liquid or dried eggs, etc. Provided nutritional, contagious and parasitic diseases are kept under control by adopting appropriate measures, the success of the poultry industry depends upon proper management and selection of suitable breeds which will thrive under local conditions. To enable those who are interested in this industry to make a selectiou of Indian breeds of poultry a description, with illustrations, of some breeds of Indian fowls, ducks and geese is presented in this article. Most of the indigenous breeds of poultry so far recognized in this country have been dealt with, but it is not claimed that the list is exhaustive. The breeds have been described under two heads, *viz*; (i) Indigenous breeds of fowls, and (ii) Ducks and geese.

I. INDIGENOUS BREEDS OF FOWLS

The Asil or Indian game.—The Indian game fowl is the most renowned breed in India and it is found in every province. It can lay claim to being a pure indigenious breed originally raised for fighting purposes only, and the decline in this sport has resulted in its deterioration. It is bred in many parts of India to definite colour and type, particularly in Hyderabad-Deccan, the Punjab, Rampur State and around Lucknow. There is no fixed standard colour for the back, eyes, or legs, though the comb, face, jaws and throat are red. Some of the principal colour varieties are *kala* (black), *lakha* (dark red), *jawa* (duck-wing), *surkha* (bright red), and *zarda* (yellow). They are poor layers and though they have ideal table qualities, their slowness in growth and low fecundity stand in the way of commercializing them as table birds. The cock shows a breast and a thigh which are rarely found in other breeds, and he can be used very successfully in crossing with hens of a good laying strain for the production of table poultry. The head is short and broad between the eyes and the beak is strong and thick. The comb is very small and varies in type.

The face is hard and wattle small or absent and the earlope small. The neck is of medium length and exceptionally powerful and scantily feathered. The body and tail are short, the chest and back are wide and legs and thighs are muscular and set apart. These qualities coupled with richly coloured feathers give them an attractive appearance. There is no standard weight for the breed, the males generally weighing between 5 to 10 lb. and the females 4 to 6½ lb.

At the Government Poultry Farm, Gurdaspur, Punjab, a hen on an average lays 34 to 38 eggs in a year, the highest individual record being 88. The egg is a large one and the fertility percentage and hatchability percentage of fertile eggs have been found to be 80 to 88 and 80 to 90 respectively. It takes about 16 and 17 weeks for a cockerel and a pullet respectively to reach 2 lb. live weight, the average weight of a bird at 24 weeks being 62·83 oz.

The Teni or Desi.—This is a common fowl found all over India and includes many different types Despite the lack of uniformity found amongst them they have certain characteristics in common. It is small in size, an adult hen weighing about 3 lb. and a male about 4 lb. Their body is compact and solid, the breast bone is well covered and the plumage is light and wiry. The skull is fairly broad and beak is short and stout, and eyes in good types are bright and bold. The comb, wattle and earlopes are small in size. The back is short and broad and the chest is wide. As the bird is an active forager and excellent sitter and stands up well to hot weather conditions, it is found suitable as an all-purpose bird for village conditions. It is, however, a very poor layer with pronounced broodiness, laying in clutches 12 to 15 eggs at a time, the annual production ranging from 30 to 45 eggs weighing about 1 oz. each.

The Naked-neck.—They are generally bred on the west coast of Bombay and are similar to a breed found in Hungary. Probably they have a common origin. The colour and shape of the body is not yet fixed. The average body weight of a cock and a hen is 4¼ and 3 lb. respectively. It lays on an average about 100 eggs in a year. The average weight of an egg which is pale white in colour is about 1·15 oz.

The Improved Punjab Brown.—This breed has been evolved by selective breeding at the Government Poultry Farm, Gurdaspur, Punjab. As the name suggests, they are usually brown in colour with yellow beak, legs and feet. These birds are good for table purposes. It takes abont 17 and 17½ weeks for a cockerel and a pullet, respectively, to reach two pounds live weight, the average weight of a bird at 24 weeks being 52·33 oz. The average weight of a male bird is about 6½ to 8 lb. and that of a female about 4 to 4½ lb. At the Farm, a hen on an average lays about 80 eggs in a year, the highest individual record being 121. The average weight of an egg is about 2·02 oz. and the shell is brownish in colour. The fertility percentage of eggs incubated and the hatchability percentage of fertile eggs have been found to be about 87 to 98 and 91 to 94 respectively.

The Improved Punjab Black.—This is another breed evolved at the Government Poultry Farm, Gurdaspur, Punjab, and is good for table purposes. They are black in colour with yellow beak, legs and feet. The average weight of a male bird is about 6½ to 7½ lb. and that of a female about 4 to 4½ lb. A hen on an average lays about 90 eggs in a year at the Farm. The average weight of an egg which is brown-shelled is about 1·75 oz.

The Kashmir Faverol—These birds have red and black feathers and yellow beaks. Their legs are also yellow and are feathered. In the male the comb and wattles are small but the former stands erect. In the female the wattles are very small and the comb is feathered. The average body weight of a cock is 4 to 4½ lb. and that of a hen 3¼ lb. On an average a hen lays about 98 eggs a year and the average weight of an egg is 1¼ oz. The breed is at present under improvement at the Government Poultry Farm, Srinagar.

The Titri.—This is a speckled black and white breed with yellow beaks and legs. Their feathers are also striped with a yellow hue. In both sexes the comb is held erect but in the female it is small. The average body weight of a cock is about 4 lb. and that of a hen 3 lb. The breed is under improvement at the Government Poultry Farm, Sringar, where a hen on an average lays about 57 eggs in a year and the average weight of an egg is 1⅛ oz. In the village it lays on an average 20 to 30 eggs annually.

The Busra.—These birds are fairly common in Kathiawar and around Bombay and are evidently imported from the Persian Gulf. The Busra hen is a bird typically built for egg production. A deep bodied bird, light in feather, alert, and though smaller than a Leghorn in appearance weighs 4½ lb. as a pullet. The breed is distinguishable by its semi-buttercup comb, grey legs, and a tuft of feathers on the head. The colour varies, and requires stabilizing, but the main characteristics of the type are apparent in all colours. The egg is large and white, in many cases reaching the 2 oz. standard. Broodiness is not so troublesome as in Indian hens. The broody period is easily broken and within a few days the hen returns to lay. At the United Provinces Poultry Association Farm at Lucknow the average egg production per hen is reported to be about 55 during the four months of winter, viz. November to February.

The Chittagong.—The colour of the adult bird is white with a splash of gold marking on the wings. The skull is small and narrow, beak is short and strong, and eyes are full, bold and set high in the skull. The comb is usually single and short, earlopes and wattles are red and small. The neck is long and neat and the body is relatively short for its height, narrow with rather prominent breast bone. The legs are long and fairly thick and shanks yellow in colour and devoid of feathers. The plumage is short and tight, rather devoid of fluff, and sparse at the breast bone. The weight of a male bird is between 4½ to 5 lb. and that of a female 3½ to 4 lb. It is a very useful breed, and it not only lays on an average 130 eggs a year but it grows rapidly and is suitable for the table.

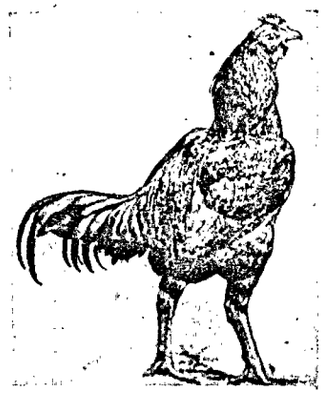

FIG. 1. Asil or Indian game cock

FIG. 2. Teni cock

FIG. 3. Naked neck pullet

FIG. 4. Naked neck cockerel

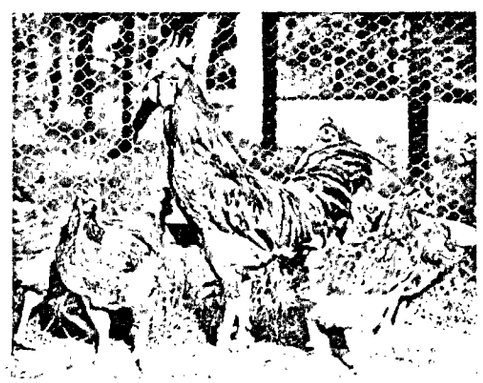

FIG. 5. A group of Punjab brown fowls

FIG. 6. Improved Punjab black cock

(By the Courtesy of I. C. A. R.)

FIG. 7. Kashmir Faverol hen

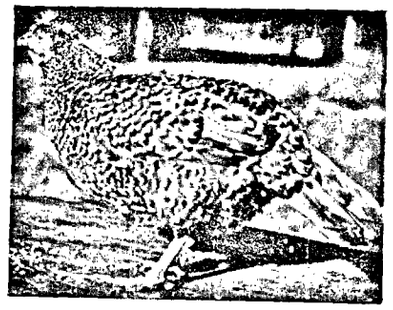

FIG. 8. Titri hen

FIG. 9. Busra hen

FIG. 10. Busra cock

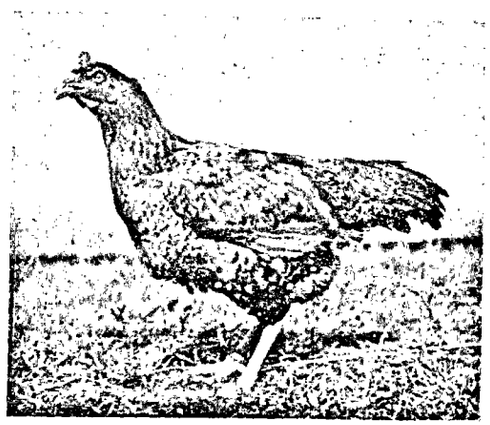

FIG. 11. Denki hen

FIG. 12. White breasted Nageswari ducks

(By the Courtesy of I. C. A. R.)

Most of the eggs are small, although a percentage may weigh 1½ oz. The period of maturity or the time taken to lay the first egg is on an average about 183 days, with 222 days as the maximum and 150 days as the minimum.

At the Government Poultry Farm, Gurdaspur, Punjab, the fertility percentage of eggs incubated and the hatchability percentage of fertile eggs has been found to be 68 to 91 and 72 to 87 respectively. It takes about 18½ and 21 weeks for a cockerel and a pullet, respectively, to reach two pounds live weight, the average weight of a bird at 24 weeks being 55·42 oz.

The Tellicherry.—This black skinned breed is found in Malabar, where it is used for medicinal purposes by Ayurvedic physicians. It has variously coloured plumage. Some birds are black, others black and grey mixed and some others have various combination of colours. The body is round in shape and the legs are short. The eyes are usually black, but in some birds they are orange in colour. The male bird weighs about 3½ lb. and the hen about 2½ lb. The eggs are tinted. An average of 85 eggs per hen in a year is recorded and each egg weighs about 1¼ oz. Individual birds have reached an annual yield of 141 eggs. The period of maturity is on an average about 180 days with 232 days as the maximum and 139 as the minimum.

The Denki.—These birds are found in Vizagapatam district of the Madras province. They are fairly large in size, especially the males, but are slow maturers. The cocks have rather long legs, and long necks like a game fowl. They are very good fighters and people rear them for cock fight. This is an attractive and handsome breed owing to the lustrous and glossy appearance of its red plumage which at times is mixed with dark colour. They have a single compressed comb which is rosy in colour and the legs and feet are yellow. The hens are poor layers and in the villages a bird lays on an average about 35 to 40 eggs in a year. At the Poultry Research Station, Madras, their egg production has been increased to nearly 112 per year by selective breeding, proper feeding and management The egg production is generally higher during February and March but it falls off as the hot weather approaches. On an average an egg which possesses a fairly white shell weighs about 1·5 oz. The birds do not carry much flesh and for table purposes the hens are more relished than the cocks. The average weight of a male bird is about 5½ to 6 lb. and that of a female about 4 to 4½ lb. They have a strong inclination for broodiness and take a long time to recover.

The Kalahasti.—These birds closely resemble the Denki, but are slightly smaller in size. The cocks of this breed are also good fighters and people rear them for this purpose. They are found in the Kalahasti area of the Chittoor district in the province of Madras. The birds are attractive in appearance on account of red lustrous plumage, though at times it may be mixed with dark colour. The hens are poor layers and in the villages a bird lays on an average about 30 to 35 eggs in a year. At the Poultry Research Station, Madras, their

egg production has been increased to nearly 106 eggs per year by selective breeding and proper feeding and management. The eggs are white shelled and the average weight of an egg is about 1·4 oz. The birds carry very little flesh and are of little value for table purposes. The average weight of a cock is 5 to 5½ lb. and that of a hen about 3½ to 4 lb.

II. DUCKS AND GEESE

India and Burma contain about one-fifth of the world's recorded duck population and excluding China, they possess more ducks than all the other countries put together. The total value of ducks and geese in India amounts to about one crore of rupees. A survey carried out recently by the Central Agricultural Marketing Department indicates that in Travancore, Cochin, Madras, Bengal and Assam, where semi-aquatic conditions prevail, ducks are raised in large numbers. They are generally raised for the production of eggs and, except in large towns and cities, ducks and geese are not in great demand for the table, as in Europe or America. The popularity of ducks among village producers is due to the fact that the average production of eggs per bird per year is higher than that of hens. In Cochin, this may be as high as 130 per bird. Also, mortality through disease in these birds is remarkably low, broodiness is not pronounced, and generally speaking they do not require as much attention as fowls.

The White Breasted Nageswari Duck.—The Nageswari is the local name for a type of duck which lays a pale blue egg. It has been suggested that the name has something to do with the snake-like markings on the beak which is yellow in colour. The back and most of the body is black and the breast and throat are white. Ducks of this type are found in the districts of Cachar and Sylhet in the Surma Valley of Assam and in Eastern Bengal, mixed with ducks of other colouring and types. These ducks are active feeders and their tendency to go broody is low. The moulting period is brief, viz. from 1st August to 15th September. An adult bird weighs 3 to 4 lb. Under farm conditions, a duck of this type lays 80 to 150 eggs in a year. Under village conditions, it is estimated to lay 50 to 60 eggs a year. The average weight of an egg is 1¾ to 2 oz.

The Sylhet Mete Duck.—The Sylhet Mete is the ordinary duck of the villages in eastern India. It is light brown in colour with black tips on feathers and yellow beaks. It lays a white egg and is more thickly built and shorter than the Nageswari. When in full feather the drake has a blue neck and head. An adult bird weighs 3 to 4 lb. The moultlng period is between 1st August and 15th September, but in some cases it may extend up to 30th September. Under farm conditions, a duck of this type lays 80 to 150 eggs a year. Under village conditions, it is estimated to lay 40 to 60 eggs a year. The average weight of an egg is 1¾ to 2 oz.

FIG. 13. Indian runner duck

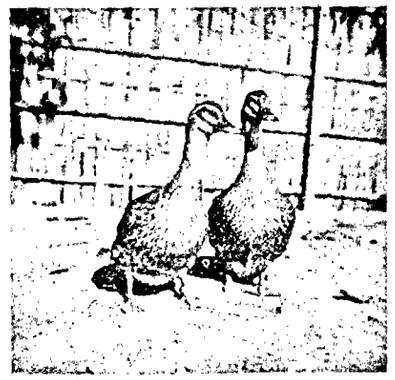

FIG. 14. Sylhet Mete pair

FIG. 15. White geese (Assam)

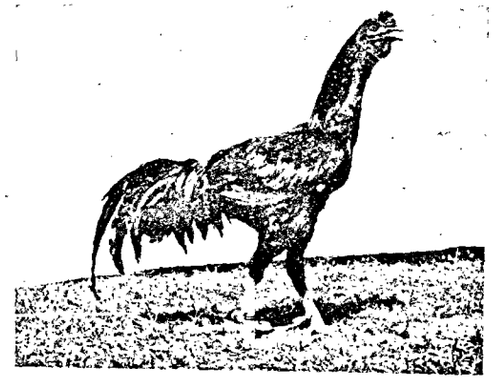

FIG. 16. Kalahasti cock

FIG. 17. Brown-backed goose

(By the Courtesy of I. C. A. R.)

The Indian Runner Duck.—These are found in most of the provinces in India, but only in a few places are they bred pure. They are white in colour and their body is carried in a noticeable, upright position. The average live weight of a duck and a drake is 4½ and 5½ lb. respectively. A village duck of this breed lays on an average about 54 eggs, in a year, but in other parts of the world good egg laying strains have been developed. The average weight of an egg which is white in colour is over 2 oz.

Brown-backed and White Geese.—Geese of these colouring are found everywhere in India, often mixed together. If they interbreed, the crosses do not show any mixed colouring, and the progeny remain either of one type or the other. The brown-backed goose has a white belly and brown wings, back and head. The breast is light brown and the throat is white. The white goose is white all over. The everage live weight of a gander and goose is 7½ to 8 and 6½ to 7½ lb. respectively. They lay two clutches of eggs a year of 8 to 10 each. The average weight of an egg is 4 to 4½ oz. For table use these birds are considered to be excellent, especially if grass-fed On free range with plenty of grass, geese will devour huge quantities and require no other type of food. They will keep a lawn clipped close but the quantity of dung voided sometimes renders this an undesirable practice to adopt.

ANATOMY OF THE DOMESTIC FOWL

By

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The structure of the fowl differs in many respects from that of mammals. The following brief notes are so prepared as to bring to the attention of the reader some of the more important differences which are observed in the domesticated fowl as compared with that of domesticated mammals. The notes will be particularly useful to students and to those who are not able to get at books containing the literature on the structure of fowl.

Skeletion :

The osseous tissue is exceedingly compact and hard. Some of the bones are pneumatic or contain air instead of marrow.

Head :

The fowl's head is rather small and is of conical shape in front. The bones of the skull become fused early—some before the chick leaves the egg and others, shortly after hatching and thus lose their individual identity.

intertransverse spaces are filled by thin bone which brings about the fusion of the processes with each other. Four dorsal vertebrae from the second to the fifth are fused together, the first and the sixth are free and the seventh is fused with the first lumbar vertebra.

No distinction can be made between the lumbar and sacral vertebrae. They are at first free and fourteen in number but soon become fused with one another to form a single bone - the lumbo - sacral which in its turn is fused with the last dorsal in front and the first coccygeal behind. This fused piece is rapidly united for its entire extent to the ilium on either side.

The vertebral column recovers its mobility in the coccygeal region which consists of seven vertebrae. The last piece—the ploughshare bone or the pygostyle which is the largest of the coccygeal vertebrae is formed by the fusion of two or more of these vertebrae. This piece is flattened from side to side, projects upwards at the end of the vertebral column, becomes gradually narrower behind, ends in a point which is curved upwards and serves as a support for the tail feathers and the coccygeal gland.

Ribs :

Of the seven pairs of the ribs present in the fowl, the first and the second and sometimes the seventh do not reach the sternum. Each rib consists of an upper segment - *the vertebral or superior rib* and a lower segment—*the sternal or the inferior rib.* The former corresponds to the mammalian (osseous) rib while the later corresponds to the mammalian costal cartilage. The upper extremity of each inferior segment articulates with the lower extremity of its upper segment in a diarthrosis. The inferior extremity of each sternal rib presents a double facet and articulates with the sternum. Each of the ribs from the second to the sixth presents about its middle a flat process—*the uncinate process* which is directed from the posterior border of a rib backwards, lies over the external face of the next rib and is attached to it by a ligament. These processes help to increase the solidity of the thorax.

Sternum :

The sternum of the fowl is a quadrilateral curved plate of bone and is formed by the fusion of five pieces. It forms not only the floor of the thoracic cavity but also forms a large protection to the abdominal cavity. The main portion of the bone— the lophosteon is the central piece and its posterior border is continued by a median projection—the middle xiphoid process. Its inferior surface carries on its median line a longitudinal plate-like ridge the sternal crest or keel. The middle of its anterior border presents the episternal process or rostrum on either side of which is an articular area for the coracoid. A ridge on each lateral edge of the

lophosteon is the pleurosteon which presents four or five articular double facets for articulation with the lower extremities of the sternal ribs. Each posterior angle of the central piece presents a short plate-like process which soon divides into the outer and inner xiphoid processes. The two notches seen in the dry bone on each side between the outer and inner xiphoid processes and between the inner and middle xiphoid processes reduce the substance of the sternum and are filled by a membrane in the fresh state.

Wing limb :

The fore-limbs are not useful for walking and they are transformed into wings or wing-limbs. The firmness afforded to the shoulder-girdle by the large coracoid bone, reduction of the manus, consolidation of the metacarpus, presence of the two clavicles and the union of the same to form a continuous bone which helps in the formation of a strong basis for the wing are the especial features worthy of note,

The *shoulder* of the fowl comprises of a scapula, coracoid and a clavicle. The upper end of the *clavicle* rests on the scapula and coracoid forming with them a foramen for the passage of the tendon of the elevator muscle of the wing. The lower ends of the two clavicles are united into a single flattened expansion—the hypocledium which is connected to the anterior median process—the rostrum of the sternum by a membranous ligament—the claviculo-sternal ligament. The combined clavicles form a single V-shaped bone—the fork or furcula. This fork is placed at the base of the two wings in a downward and a backward direction. It plays the part of an elastic spring-like connection between the two shoulder joints, forms a firm basis or support for the wings and prevents them from approaching each other.

The long prismatic rod-shaped *coracoid* which forms a strong basis for the bones of the wing to move upon extends obliquely downwards and backwards from the scapula to the sternum and is the strongest of the three bones of the shoulder. Its inferior extremity articulates with the sternum. Its superior extremity is prolonged into a hook-like process, which completes the remarkable foramen for the passage of the tendon of the elevator muscle of the wing. This extremity presents below the hook-like process an articular depression which forms the greater part of the glenoid cavity. The upper extremity of the clavicle is attached to the hook of the coracoid by a fibrous or fibro-cartilaginous structure—the claviculo-coracoid ligament.

A narrow, thin, elongated and slightly curved sword-shaped *scapula* extends backwards nearly parallel to the vertebral column, reaches almost the pelvis and thus lies over most of the ribs. Its anterior end presents a small depression and a projecting process and the former forms only a small part of the glenoid cavity while the latter is united to the hook of the coracoid and assists in the formation of the remarkable foramen already referred to.

The *humerus* which is a stout but slightly curved bone articulates by its upper extremity not only with the scapula but also with the coracoid.

Of the two bones of the forearm, the *radius* is the narrower of the two and is placed external to the *ulna*. These two bones are separated by a wide interosseous space except at their extremities where they are united by ligamentous bands.

In the adult fowl, there are only two *carpal bones*—the radial carpal and ulnar carpal representing the upper row of the mammalian carpus. The lower row is also represented in the embryo by cartilaginous nodules but these with the metacarpals.

The metacarpal region has three bones. The outer two of these are fused at their extremities leaving a narrow elongated space between their shafts. The innermost metacarpal is in the form of a small projection and is united to the radial side of the upper end of the fused second and third metacarpals.

Generally, the terminal segment of the wing-limb has three digits but the number of the digits and the phalanges in them vary. One of these which forms the basis of the false wing is made up of a single, long and pointed phalanx and is articulated to the base of a process on the superior extremity of the largest metacarpal bone. The second—the largest of the three digits is made up of two phalanges and is articulated to the lower extremity of the largest matacarpal bone. The third, the most rudimentary of the three is made up of a very small phalanx and is articulated to the lower extremity of the small metacarpal bone.

The Pelvic limb :

The pelvic bone—the *os coxae* is large and is fixed firmly and extensively to the vertebral column. The two ossa coxae do not meet at a symphysis in the inferior median line where they are separated by a wide space and the term pelvis - girdle is therefore not applicable to the hip bone of the fowl. As the deficiency is completed by a membrane, the inferior wall of the pelvis is rendered soft and yielding. The absence of a symphysis pelvis and the consequent weakness of the bone are compensated for by the extensive fusion of this bone with the vertebral column. This condition affords a firm basis for the hinder limb.

The *ilium* is the largest of the three segments of the os coxae. It is elongated and firmly united through the medium of a bony plate to that part of the fused vertebral column which is made up of the last one or two dorsal, lumbar and sacral vertebrae. The inner surface presents two deep concavities for the lodgement of the kidneys. The external border of this segment is free in its anterior half and the remaining posterior portion of this border is fused with the ischium.

Plate No. X Vol. XXII, No. 2

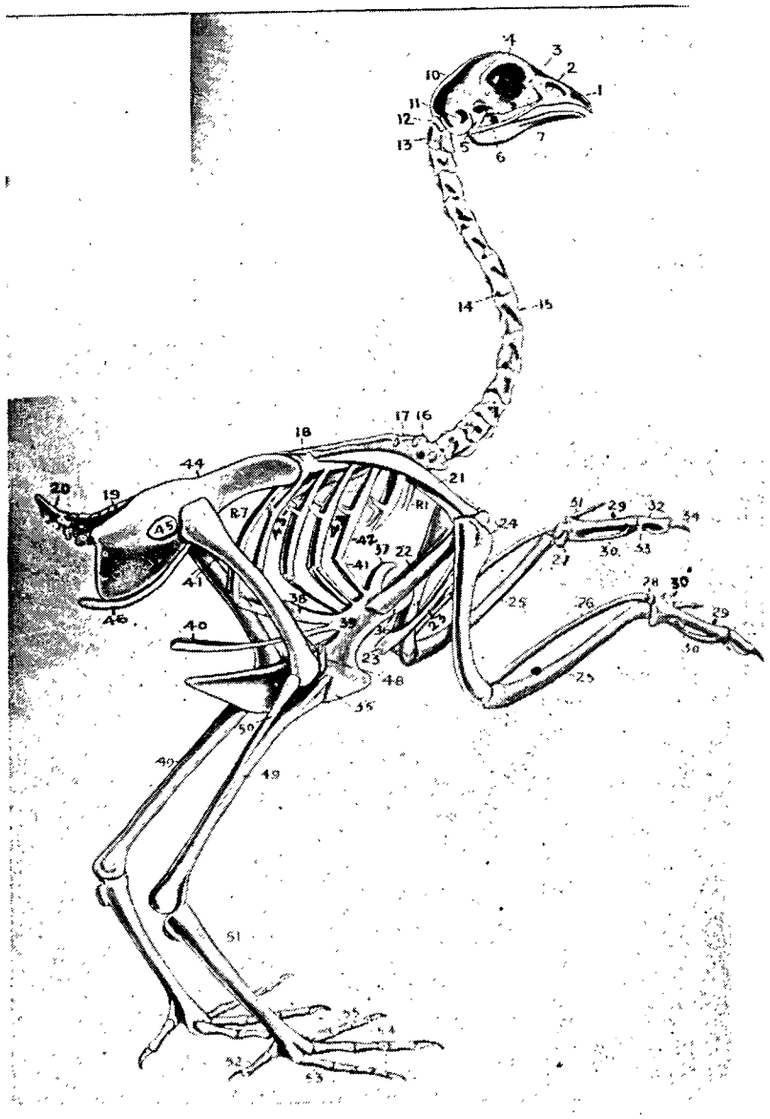


Fig. 1

1. Premaxilla, 2. Nasal, 3. Lachrymal, 4. Interorbital septum, 5. Quadrate, 6, Quadrate-jugal (maxilla), 7. Mandible, 8. Pterygoid, 9. Palatine. 10. Occipital, 11. External auditory meatus, 12. Atlas, 13. Axis, 14. Intervertebral space, 15. Styloid projection, 16. Last cervical, 17. First dorsal, 18. Last dorsal, 19. Coccygeal vertebrae, 20. Pygostyle, 21. Scapula, 22. Coracoid, 23. Hypocledium, 23¹, clavicle, 24. Humerus, 25. Ulna, 26. Radius, 27. Ulnar-carpal, 28. Radial-carpal, 29. Second metacarpal, 30. Third metacarpal, 30¹. First metacarpal, 31. First digit, 32. Second digit, 33. Third digit, 34. Terminal phalanx of the second digit, 35. Sternum, 36. Rostrum, 37. Costal process, 38. External division of 39, Postero lateral process, 40. Internal division of 39, 41. Sernal rib, 42, Vertebral ribs, 43. Uncinate process, 44. Hip-bone, 45. Sciatic foramen, 46, Pubis, 47. Femur, 48. Patella, 49. Tibio-tarsus, 50. Fibula, 51. Tarso.metatarsus, 52 to 55. Digits—(1, 2, 3 and 4), R 1 to R 7, ribs.

Fig. 2

DISSECTION OF COCK (Right Side)

(Right wing and pelvic limbs are removed ; the thoracic, abdominal and pelvic cavtties have beon opened out ; the temporo-maxillary joint has been disarticulated and the lower jaw with the floor of the mouth and tongue is reflected downwards to the left and secured ; the pharynx has been cut open and its walls are reflected).

1. Upper and 1¹. Lower beak ; 2. Mouth ; 3. Tongue ; 4. Nostril, 5. Hard palate ; 6. Median sllt—*the posterior naris* in 5 ; 7 to 7¹. Pharynx ; 8. Membrana nictitans ; 9, Comb ; 10, Wattles ; 11. External opening of the ear ; 12. Median slit—*the common opening of the Eustachian tubes*—on the roof of the pharynx ; 13. Anterior or superior larynx ; 14, Median slit—*Entrance into the larynx*—on the floor of the pharynx ; 15. Opening of the pharynx into the oesophagus ; 16 to 16¹. Trachea ; 17 to 17¹. Oesophagus ; 18. Crop ; 19. Right and 20. left clavicles ; 21. Jugnlar vein ; 22 to 22¹. Superior and 23. Inferior ribs (in Part) ; 24. Sternum ; 25. Heart ; 26. Right lung ; 27. Liver—(right lobe) ; 28. Testicle (right) ; 29. Kidney (right)., 30. Vas deferens ; 31. Cloaca ; 32. Duodenum ; 33. Pancreas ; 34. Coils of jejuno-ileum ; 35. Mesenteric lymph glands ; 36. Cervical lymph gland.

The second segment—*the ischium* is continuous with the ilium except at the sciatic foramen which is formed between the external border of the ilium and the internal border of the ischium. It is narrow below the sciatic foramen but is wide behind it. It forms the lateral wall of the pelvis. Its inferior border is joined to the pubis for a short distance in front but behind this, it is irregular, free and is separated from the pubis by an interval.

The elongated, narrow, thin strip of bone which runs backwards in the direction of the inferior border of the ischium is the third segment of the os coxae—the *pubis*. It is joined, as already remarked, to the inferior border of the ischium for a short distance in front. Its free part projects backwards beyond the ischium and curves at its extremity inwards towards the opposite bone but does not unite with it.

The *acetabulum* which is formed, as in mammals, by the meeting of the three segments is large and deep and its bottom, in the dry condition, is deficient as it is pierced by a large opening. This opening is covered in the fresh state by the *acetabular membrane.*

Note: The hip joints, in the fowl, are so placed as to maintain the balance of the body on the two hinder limbs.

The thigh bone of the fowl—the *femur* is short, cylindrical and somewhat bent. The head on its upper extremity, though prominent, is smaller than the acetabulum and therefore does not fill in the cavity completely. The articular surface is consequently prolonged beyond the head on to the trochanter. The trochlea and the condyles of its lower extremity articulate with the patella and the tibia respectively. The external condyle, besides articulating with the tibia, articulates with the fibula also.

The *patella* is wide and thin.

Of the bones of the leg, the *tibia or the tibio-tarsus* is much larger than the femur. Its lower extremity presents two condyles separated by a groove. This pulley-like articular area which represents the bone of the upper row of the tarsus is in the form of a separate cartilage in the embryo and as this piece—the homologue of the mammalian astragulus becomes fused with the lower extremity of the tibia, the whole bone (tibia) should therefore be termed as 'tibio-tarsus'. A small bone representing the mammalian Os calcis is found embedded in a fibro cartilaginous mass which glides over the posterior part of the pulley of the tibia. The other bone of the leg—*the fibula* is an elongated and slender styliform rod of bone. It articulates by its upper margin with the external condyle of the femur. Its lower extremity is pointed and terminates about the lower third of the external border of the tibia or even lower down.

The *tarsus* appears to be altogether absent in the adult fowl as the upper two elements in the embryo soon fuse with the tibia and the single lower one with the metatarsus.

The *tarso-metararsus* therefore succeeds the tibia as there is no free tarsal bone in the adult fowl. This tarso-metatarsus is represented by a single bone which results from the fusion of three metatarsal bones (2nd, 3rd and 4th). Its lower extremity consists of three articular projections for the three principal digits. The innermost or the first metatarsal is rudimentary and is connected by a ligament to the postero-internal aspect of the tarso-metatarsus. The fifth metatarsus is represented in the embryo by a cartilage which soon disappears. Though four *digits* are usually present, the number may vary. The innermost of these is rudimentary and is directed backwards and inwards while the other three principal ones radiate in a forward direction. The second, third and fourth articulate with the three pulleys on the lower extremity of the tarso-metatarsal bone. The number of phalanges in the different digits vary—the first or the innermost has two, the second three, the third four and the fourth five phalanges. The last phalanx is conical and pointed and is enclosed in a horny cover.

SPLANCHNOLOGY

The digestive system :

Though the digestive apparatus of the fowl is constructed on the same plan as that of mammals, it presents several important differences and peculiarities:—The most important difference in the mouth is the absence of the lips, teeth and cheeks. There is no provision for the mastication of food. The food is taken by the beak and is passed at once by the tongue to the pharynx. The food leaving the pharynx, enters and passes through the oesophagus to the crop where it undergoes partial maceration. From here, the food passes slowly into the proventriculus (glandular stomach),

The narrow triangular *tongue* is pointed at its free portion and is covered on its upper face by a thick layer of horny epithelium. The intrinsic muscles of the tongue are very rudimentary and the tongue therefore contains very little muscular tissue.

The *hard palate* presents a median ridge in front and a median slit measuring about an inch in length. This slit is the posterior naris or the opening of the nasal cavities. The cleft palate thus allows free communication beeween the mouth and the nasal cavities. The hard palate shows behind the median ridge four or five transverse rows of pointed, horny conical filiform papillae directed backwards. The most posterior of these rows and the row of papillae on the root of the tongue may be taken as a line of demarcation between the mouth and pharynx.

The *soft palate* is absent and the mouth is therefore continuous with the pharynx.

The *pharnyx* is relatively large. It shows a median slit on its roof and this slit is the common opening of the Eustachian tubes. A transverse row of conoidal papillae behind the slit marks the beginning of the oesophagus. The floor of the pharynx also shows a median slit—the entrance into the anterior larynx. Though this slit corresponds to the aditus laryngis of mammals, it is remarkable in this that there is a total absence of the epiglottis. Two rows of conical papillae behind this slit again mark the beginning of the oesophagus.

As the food is swallowed without any mastication, insalivation does not appear to be essential. Saliva therefore does not appear to be necessary in fowls as in mammals. Though there are no glands in the mucous membrane of the mouth, a number of mucous secreting glands are seen in the submucous tissue in the roof of the mouth, between the two halves of the mandible, in the tongue and pharynx. None of these glands have a similarity to the parotid glands of mammals.

The *oesophagus* is remarkable for its greater calibre and distensibility and is divisible into first and second parts. The first or the cervical part begins at the pharynx and extends down the neck along the median line and superior to the trachea, deviates to the right of the median line as it reaches the thoracic inlet and presents a large diverticulum—the crop. The second or the thoracic part of the oesophagus begins from the underside of the crop, enters the thorax, passes backwards superior to the trachea, between the lungs over the base of the heart, over the bronchi and finanlly terminates in the proventriculus.

The dillatation of the oesophagus—*the crop* is a simple ovoid, musculo-membranous pouch which acts as a temporary reservoir for the food swallowed. The structure of the crop is similar to that of the oesophagus but it has no secretory glands other than the mucous glands even which are found only in certain areas. The fluid secreted by the oesophageal glands and the a mount of water taken in by the animal helps the partial maceration of the food and produces a slight fermentation after which it is passed slowly into the proventriculus.

The disposition of the *stomach* in the fowl is complicated and consists of two portions—the glandular and muscular stomachs which differ in structure and function. The first stomach is the *glandular stomach* or *proventriculus* and is the smaller of the two portions. This stomach is a small, fusiform, glandular and thick-walled tube and it is in this that a fluid corresponding to the gastric juice is secreted. It lies partly on and partly to the left of the median line and is included between the two lobes of the liver. It is continuous anteriorly with the termination of the oesophagus,

narrow and constricted posteriorly and terminates in the muscular stomach. As the tube is very small, its cavity is very narrow and the food therefore does not accumulate in it for digestion but merely passes through it carrying along with it the acid gastric juice which later on acts on the proteins.

The second stomach is the *muscular stomach* or the *gizzard* which is much more voluminous than the glandular stomach. It is oval or circular in form, dense, flattened from side to side, has a rounded border and looks like a thick muscular biconvex disc. It lies behind and to the right of the first stomach and behind and partly covered by the two lobes of the liver. Two orifices arranged at a short distance from each other on the superior part of this organ mark the opening of the proventriculus into the gizzard and the origin of the duodenum from the gizzard. Its lateral surfaces are covered by a thick glistening tendinous layer which is thicker towards the centre and thinner towards the circumference. The cavity of the gizzard is large and contains food mixed with a large quantity of pebbles. This organ acts chiefly in a mechanical way as a triturating apparatus. It serves as a substitute for teeth and may therefore be viewed as an organ of mastication.

The intestines :

Though the diameter of the intestine is nearly uniform throughout, it may be divided for description into small and large intestines.

The small intestines :—The small intestine consists of the same three divisions as in mammals. *The duodenum* begins from the gizzard, extends to the right, passes along the right abdominal wall to the level of the pelvic inlet where it bends on itself forming the duodenal loop, passes then forwards to a point in front of its origin and is continued by the jejunum. The pancreas is included between the ascending and descending parts of the duodenum. The remaining part of the small intestine the *jejuno-ileum* is arranged in the form of thick coils which are held to the abdomiual roof by a loose mesentery. The two bile ducts and the two pancreatic ducts open near each other at the termination of the duodenum.

The large intestine :—The large intestine of the fowl is very short. It begins at the termination of the ileum, runs back nearly in a straight line below the vertebrae in the sublumbar region and ends in a dilatation—the *cloaca*, a common cavity which contains the openings of the digestive, urinary and genital systems. The large consists of two divisions—the two caeca and the colon. The line of demarcation between the ileum and the colon is at the beginnings of the caeca.

The *caeca* are two elongated diverticula or blind pouches which extend from the junction of the ileum and the colon and each is about four to seven inches long.

The *colon* is very short, nearly straight and extends from the ileum to the cloaca.

Plate No. XII Vol. XXII, No. 2

Fig. 3

DISSECTION OF THE COCK (Left Side)

1. Crop ; 2. Lung ; 3. Pericardium ; and heart ; 4. Coracoid ; 5. Right and 6. Left clavicle ; 7. Sternum ; 8. Superior and 9. Inferior ribs ; 10. Testicle ; 11. Kidney ; 12. Vas deferens ; 13. Coils of jejuno-ileum ; 14. Cloaca ; 15. Terminal part of ileum ; 16. Ascending and 17. Ascending parts of duodenum ; 18. Loop of duodenum ; 19. Pancreas ; 20. Proventriculus ; 21. Gizzard ; 22. Liver ; 23. Colon ; 24. Cloaca.

Fig. 4

DISSECTION OF HEN (Right Side)

1. Crop; 2. Left and 3. Right clavicle; 4. Coracoid; 5. Sternum; 6. Inferior and 7. Superior ribs; 8. Lung; 9. Heart with pericardium; 10. Liver; 11. Kidney; 12. Ascending and 13. Descending parts of the duodenum; 14. Loop of duodenum; 15. Pancreas; 16. Jejuno-ileum; 17. Cloaca.

Note:—The surface of the mucous membrane of both the small and large intestines is covered by villi.

The cloaca (cesspool) is a tubular cavity which is common to the digestive, urinary and genital tracts. It has the opening of the colon, ureters and vasa deferentia. Each ureter opens at the summit of a small papilla which lies midway between the openings of the vasa deferentia. The opening of the oviduct, in the female is in the form of a slit on the *left side.*

Note.—The material from the ureters and the intestine is held in the cloaca to form the characteristic droppings and is then passed out.

The liver—the largest gland in the body, lies in the inferior part of the body cavity. It adapts itself to the inferior and lateral walls of this cavity but is partly separated from them by the abdominal and thoracic air-sacs. It consists of two lobes—right and left, of which the former is the larger of the two. As the diaphragm in the fowl is rudimentary, the position of the liver cannot be regarded as entirely abdominal. It lies below and behind the heart. The Apex of the heart and the pericardium lie between the anterior parts of the two lobes. The right and left lobes are connected together by a double fold of peritoneum. A ligament which extends from the sternum and blends with the serous coat of the liver also assists in holding the organ in its position.

The visceral surface of the right lobe presents a relatively large gall-bladder. Two bile ducts carry the bile from the liver and pour it into the duodenum. The duct from the left lobe is the hepato-enteric duct. The duct from the right lobe first pours the bile into the gall-bladder and a duct—the hepato-cystic duct begins from the gall-bladder and opens into the duodenum close to but behind the hepato-enteric duct.

The thin, narrow, long, lobulated, pale yellow or reddish gland which occupies the space between the two branches of the long duodenal loop is the well developed *pancreas.* Its extremity next to the muscular stomach shows the two (sometimes three) chief pancreatic ducts which open independently into the duodenum in front of the hepatic duct. The ducts of the pancreas and liver open into the duodenum in the following order.—First, the pancreatic ducts, next, the hepato-enteric duct and the last, the hepato-cystic duct.

The spleen is a small reddish-brown rounded body placed superiorly and to the right in the angle formed by the junction of the proventriculus and the gizzard.

Respiratory tract.:

The organs of respiration in the fowl differ markedly from those of mammals.

The two small narrow rounded or oval openings at the base of the upper part of the beak represent the *nostrils*. These openings are surrounded by a thin fold of skin and a border of peculiar feathers or even scales.

The short and narrow *nasal chambers* are separated by a complete osseo-cartilaginous septum. The turbinate bones of mammals are represented by cartilaginous structures. Each cavity has three such rudimentary cartilaginous turbinates. The nasal cavities communicate posteriorly with the mouth and pharynx by a common elongated slit-like opening in the roof of the mouth (in the median line of the hard palate).

The upper or the *anterior larynx* corresponds to the larynx of mammals but serves only as an opening for the passage of air. It lies at the anterior end of the trachea and just behind the root of the tongue. This anterior larynx opens into the floor of the pharynx by a narrow elongated slit-like opening and corresponds to the aditus laryngis of mammals. The epiglottis which closes this aditus in mammals is absent here and the laryngeal orifice is closed by the exact meeting of its two lateral lips.

The framework of this larynx is made up of cricoid and arytnoid cartilages only. The cricoid is not in the form of a continuous ring as in mammals but is made up of four segments (superior, inferior and two lateral) which are so arranged as to form a ring. As this larynx is not provided with vocal cords, it is not concerned in the production of voice.

The *trachea* is relatively long in the fowl. It is composed of complete cartilaginous rings. The last ring forms the *posterior larynx* or *syrinx* which is the organ responsible for the production of voice. The last tracheal piece is dilated and shows at the origin of the bronchi, a membranous layer the vibrations of which produce the crowing. The trachea terminates by dividing into right and left *bronchi*.

The cartilaginous rings in the *bronchi* are incomplete and a portion of the tube is therefore membranous. Each bronchus—the *stem bronchus* (mesobronchus) enters the lung at its inferior surface, and gives off branches to this organ and to the air-sacs of the thorax and abdomen. Each stem-bronchus dilates after it enters the lung, loses its cartilaginous rings, continues then as a duct-like tube to the extreme posterior edge of the lung and terminates into a cartilaginous ring through which it communicates with the abdominal air-sac .

Each stem bronchus gives off within the lung a number of large and small *secondary bronchi* some of which communicate directly or indirectly with the cervical, clavicular and thoracic air-sacs. These secondary bronchi give off numerous *tertiary bronchi* and these radiate towards the surface of the lung and end there blindly. Each tertiary bronchus forms

the centre of a pulmonary lobule. There arise from each tertiary bronchus a number of tubes and these terminate in dilatations which correspond to the alveoli of the mammalian lung. The lungs are relatively small, flat and oval organs and are closely applied against the sides of the vertebrae and the ribs to which they are kept attached by areolar tissue. The lungs occupy only a small portion of the thoracic cavity and the ribs indent the organ in such a way as to allow the outer part of its superior surface to project slightly between them. It is by the superior surface that each is kept attached by areolar tissue to the vertebrae and ribs. The inferior surface of each lung is free and presents orifices through which the air passes to and from the air-sacs.

Air-sacs :

These are bladder-like membranous receptacles with delicate walls and the air is carried into them by the branches of the bronchi. These sacs are in direct communication with the bronchial tubes on one hand and with the air spaces in many of the bones on the other. These air-sacs are important respiratory organs. They also confer lightness and buoyancy on the body as their position is mainly dorsal and thus influence the position of centre of gravity. The thoracic and abdominal air-sacs are developed between the walls of the thorax and abdomen on one hand and the thoracic and abdominal organs on the other. The air-sacs do not communicate with each other but are independent.

The membranous wall of the sacs is composed of two delicate layers—an internal *mucous* and an external *serous* layer. The mucous is continuous with that of the bronchi while the serous layer is the reflection of either the peritoneum or the pleura.

The air-sacs, in all, are eleven in number—cervical, clavicular, axillary, anterior thoracic, posterior thoracic and abdominal. Of these, the *clavicular sac* is *single* and all the *others* are *paired*.

The *cervical sacs* lie at the base of the neck partly above the clavicular sac and supply air to the cervical and dorsal vertebrae and the superior ribs.

The unpaired *clavicular sac* is at the anterior part of the thoracic cavity, above the clavicle, surrounds the syrynx, the bronchi and the large blood vessels in this region and is continued on each side as the *axillary sac*. It receives air by two openings on the anterior part of the lungs and supplies it to the sternum, inferior ribs, the bones of the shoulder-girdle and the humerus.

The thoracic sacs extend from the clavicular sac to the abdominal sacs and are anterior and posterior on each side. They lie between the lungs, the heart and the abdominal viscera at the rudimentary diaphragm and thus help in separating the thoracic and the abdominal organs. The anterior sac

communicates with the lung by one or two openings while the posterior one communicates by an orifice placed about the middle of the external border. These *thoracic sacs do not communicate with the interior of bones.*

The abdominal sacs lie between the superior and lateral walls of the abdomen on one side and the abdominal organs on the other and are the largest of the air-sacs as they extend from the lungs to the cloaca. They extend into the posterior part of the pelvic and thigh bones. Each of these sacs receives a mesobronchus and supplies air to the sacrum, os coxae and femur.

The *thyroid gland* is made of two oval dark red bodies which are placed one on each side of the trachea and oesophagus at the root of the neck.

The *thymus* shows maximum degree of development in young chicks and is elongated and lobulated. It is situated in the neck along the jugular vein. It undergoes diminution in size with age and may be entirely absent in adults.

THE URINARY ORGANS

The urinary system consists only of two kidneys and two ureters. The *kidneys* are elongated and very irregular. Each kidney consists of three or four lobes and the divisions are marked by fissures. Each is about two and a half inches in length. It is quite soft in consistence, very friable and therefore tears off either during the removal or when pressed by the finger. It lies closely applied against the vertebral column—from the upper end of the sixth rib, immediately posterior to the lung superior to the large intestine—to the deep depression formed by the vertebral column and the iliac fossa. The most anterior lobe is the largest and the middle is the narrowest.

The ureters are right and left. Each begins at the anterior part of the inferior surface of the kidney, runs backwards parallel to the median line and opens into the cloaca which may be taken to represent the the urinary bladder of mammals and where the urine is mixed up with the faeces. It is very easy to recognise the course of the ureter by the white colour of the urates which it carries and which correspond to the urine of mammals. The terminal opening the ureter into the cloaca is placed internal to that of the vas deferens in the male and to that of the oviduct in the female. The excretory part of the urinary apparatus is thus formed only by the ureters.

The small, reddish, oval or elongated bodies lying against the internal part of the anterior end of the kidneys are the *adrenals.* The cortical and the medullary portions which are distinct in these organs of mammals are indistinguishable in the fowl.

The Genital System :

The *male generative organs* consist of the two testicles and their excretory ducts—the vasa deferentia.

The testicles—globus major are bean-shaped or oval organs situated in the sublumbar region of the abdominal cavity occupying almost the position of the mammalian kidneys and are attached to the abdominal aorta and the vertebral bodies by loose connective tissue. Their size varies greatly with the species, size of the subject and season. They increase in size during breeding season and shrivel again after the season. The left testicle is usually the larger of the two. They are pale yellow in colour. They lie behind the lungs, below the anterior parts of the kidneys and at the level of the last three ribs. The right contacts the superior part of the right lobe of the liver while the left is related to the proventriculus and intestine. At the internal or the concave border of each testicle, is a small, short, flat and rudimentary *epididymis* (*globus minor*).

Each *Vas deference* arises from the rudimentary epididymis and passes backward in a flexuous manner along the kidney, along the ureter, enters the cloaca and opens here on the summit of a small papilla external to the opening of the ureter. It is narrow at the origin but widens as it runs towards the cloaca. The vas deferens is kept attached to the lumbar and pelvic walls and the inner side of kidney by connective tissue.

The female genital organs :

The reproductive organs of the hen are limited to the ovary and oviduct.

There are two ovaries and two oviducts in the embryo but the right ovary and oviduct undergo degeneration during embryonic life and soon disappear. Only the left ovary and oviduct develop and constitute the organs of reproduction in the hen.

This single *left ovary* which is placed in the left sublumbar region of the abdominal cavity opposite to the last two ribs is a large body and is composed of loosely connected rounded objects, each containing an ovum. The number of these objects is variable. The size of these objects or vesicles varies greatly depending on the stage of development of the ovum contained within each such vesicle. The vesicles are small and white when very young but they are very large and yellow when well developed. The ovary contacts the posterior end of the left lung anteriorly, the left adrenal and the anterior portion of the left kidney superiorly, the proventriculus and spleen inferiorly and the posterior vena cava internally.

The *ovum* or the yolk is surrounded by a thin but very vascular capsule. The capsule is continued back on to the stalk which attaches it to the central fibrous supporting portion of the ovary.

Note:—As already remarked, both the right and left oviducts are present in the embryo but the right one usually disappears and the left one commonly develops.

Note:—Though the right ovary and the right oviduct usually fail to develop, a rudimentary right oviduct is occasionally present.

The oviduct is a long, very wide flexuous and dilatable tube. It acts not only as the duct of the ovary but also assists in forming the egg. It varies in its length and size according to the age, size and weight of the body and the functional state. Its beginning which is at the anterior part of the abdominal cavity is in the form of an expanded *funnel or infundibulum*. The margin of this infundibulum is not fimbriated as in mammals. It passes back on the upper part of the left body-wall, contacts the ilium and ischium and opens into the cloaca external to and immediately in front of the opening of the left ureter. Though the orifice at the termination of the oviduct appears very narrow, it is capable of considerable dilatation when the egg passes through it.

The tube is kept in position between two peritoneal layers which constitute the *superior* and *inferior ligaments of the oviduct*. The superior ligament attaches the oviduct to the superior wall of the body cavity. The superior border of the inferior ligament is attached to the oviduct while its inferior border is free, muscular and thick.

The oviduct is divisible into five parts and these in order from before backwards are:—

1, The infundibulum is the first part and this is membranous, delicate and funnel-like in form. Its anterior end presents an oblique, elongated and slit-like opening—the *abdominal opening* and it is through *this opening that the ovum enters the oviduct.*

2. Succeeding the infundibulum, is the very thick walled *albumin secreting portion*. More than half the total length of the oviduct forms this portion.

3. Succeeding the third portion is a narrow portion—the *isthmus* and this portion is the *shell membrane secreting portion.*

4. Succeeding the third portion is a thick walled wide portion which corresponds to the mammalian uterus. This portion is the *shell gland region* and forms the shell.

5. Succeeding the fourth portion is a narrow short portion—*the vagina* which corresponds to the mammalian vagina. Its entrance into the cloaca is guarded by a sphincter muscle.

Plate No. XIV Vol. XXII, No. 2

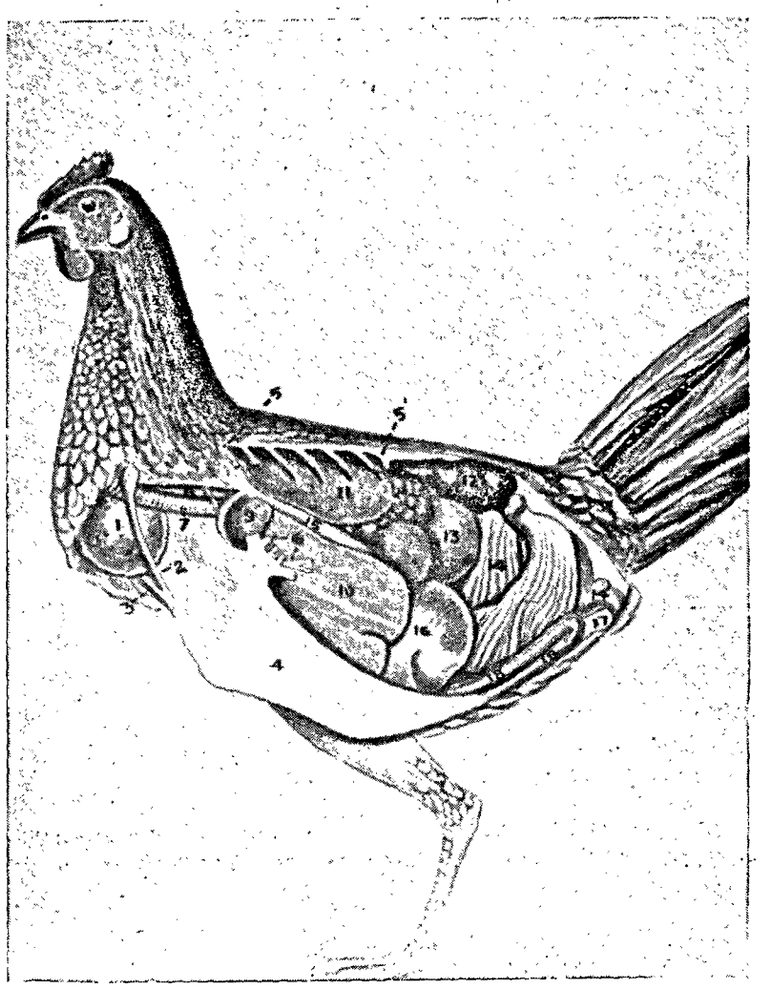


Fig. 5

DISSECTION OF THE HEN (Left Side)

1, Crop; 2. Right and 3. Left clavicle; 4. Sternum; 5 to 5₁. Superior and and 6. Inferior ribs (in part); 7. Trachea; 8. Oesophagus; 9. Heart with percardium; 10. Liver (left lobe); 11. Lung (left); 12. Kidney (left); 13. Ovary; 14 to 14₁. Oviduct; 15. Proventriculus; 16. Gizzard; 17. Terminal part of large intestine; 18. Ascending and 19. descending parts of duodenum;

The mucous membrane of the oviduct has glands which form the albumin, shell membrane and shell. The number and size of these glands in the mucous membrane differ in the different parts of the oviduct. These glands are altogether absent in the vagina, in the form of gentle depressions in the infundibulum and large and numerous in the remaining parts of the oviduct.

ANGIOLOGY

Blood vascular system :

The *pericardium* is thin and membranous. It is attached to the sternum and the falsiform ligament of the liver. It is related to the sternum below, anterior thoracic air-sacs and the liver laterally and clavicular air-sac, trachea and oesophagus above.

The *heart* lies at the entrance into the chest with its base directed upwards and forwards and the apex downwards and backwards slightly to the left of the median line. The apex lies in the anterior portion of the fissure formed by the two lobes of the liver. The heart is in the form of an acute cone. The auricular mass is less distinct than in mammals and the ventricular portion there forms the greater portion of this organ.

The venous blood drained from all parts of the body except the lungs is poured into the right auricle by two anterior venae cavae. A muscular fold—the Eustachian valve lies to the right of the opening of the posterior vena cava. The right auriculo-ventricular opening is crescentic. The right auriculo-ventricular valve is not tricuspid as in mammals but is composed of a wide muscular leaf which appears to be a part of the inner wall of the ventricle detached from the interventricular septum and which is attached to the external wall. The free edge of this leaf projects downwards and inwards. The right auriculo-ventricular orifice lies between the septal wall internally and the muscular leaf externally. The musculae papillares are absent in the right ventricle. The opening of the pulmonary artery is guarded, as in mammals, by the pulmonary valve consisting of three semilunar cusps. The aortic opening is guarded by the aortic valve consisting of three semilunar cusps as in mammals. The interauricular septum is thin and shows a thinner oval area—the fossa ovalis, at its centre. The left auriculo-ventricular opening is circular and is guarded by cusps corresponding to the tricuspid valve of mammals.

Both the pulmonary artery and the aorta are short. The aorta first gives off the right and left coronory arteries. Then, after a short course, it gives off two nearly equal branches—the left and right brachio-cephalic trunks of which the former first comes off the aorta and the latter, a little later on. Each brachio-cephalic artery divides into a subclavian and a cephalic trunk. From the cephalic trunk arise the superior cervical, vertebral and common carotid arteries. Each subclavian artery divides into the axillary and pectoral branches.

The right and left carotid arteries ascend the neck near each other and below the longus colli from the thirteenth to the second cervical vertebrae and then diverge to reach the border of the jaw where each terminates by dividing into two branches—the internal and external carotid arteries.

The aorta after giving off the brachio—cephalic trunks turns backward and to the left inferior to the vertebral column as far as the pelvis, gains the median line about the level of the anterior extremity of tne kidneys and reaches the sacrum where it divides into three branches—one for each pelvic limb and a third—the middle sacral artery.

The anterior mesenteric artery supplies most of the small intestine while the posterior mesenteric artery supplies the large intestine (the colon, caeca and cloaca).

The anterior lobe of each kidney is supplied by the corresponding renal artery while the middle and posterior lobes of each kidney is supplied by branches from the femoral artery which takes the place of the external iliac artery of mammals.

Veins :

A single terminal trunk formed by the union of two pulmonary veins opens into the left auricle,

The anterior venae cavae are right and left. Each of these is formed by the union of a jugular vein and a subclavian vein which receives blood from the sterno-clavicularis, thoracic and axillary veins.

The jugular veins are right and left of which the former is the larger of the two. They are not the satellites of the carotid arteries. The jugular veins are placed superficially on the sides of the trachea while the carotid arteries are on the median line below the longus colli. The two jugular veins are connected by an oblique or transverse branch just below the base of the cranium.

The posterior vena cava is short. It begins internal to the anterior extremities of the kidneys by the union of the right and left common iliac veins, passes forwards enbedded in the substance of the right portion of the liver and receiving the hepatic veins and opens into the right auricle. Its tributaries are the renal, femoral, internal iliac, caeco-colic-cloacal and coccygeal veins.

Each common iliac vein is formed usually as follows:—The venules from the coccygeal region unite to form a single coccygeal vein which passes forwards along the median line under the coccygeal vertebrae and unite with the caeco-colic-cloacal vein whieh conveys blood from the caeca, colon and cloaca. The trunk formed by the union of the coccygeal and caeco-colic-cloacal veins divides into two branches—right and left. Each of these passes outwards and forwards buried in the posterior and

middle lobes of the corresponding kidney and is joined by the internal iliac vein. The trunk thus formed gains the groove between the middle and the anterior lobes of the kidney and joins the femoral or the external iliac vein to form the common iliae vein which then receives the renal vein and joins the same vein of the other side to form the posterior vena cava.

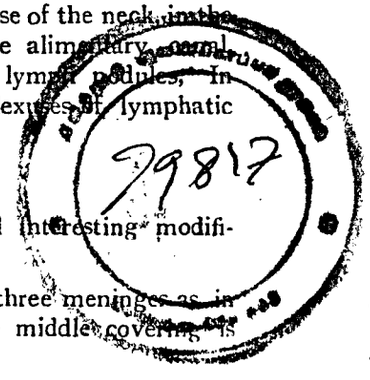
The portal vein is formed by the union of the anterior and posterior mesenteric veins. The trunk thus formed is joined by the pancreatico-duodenal and gastro-splenic veins and divides into right and left branches. Each branch then enters the corresponding lobe of the liver.

The Lymphatic System :

The lymphatic system of the fowl consists of the lymh vessels and lymph glands.

The lymph vessels are numerous and the largest of these are the thoracic ducts. The lymph vessels from the posterior parts of the body and the abdomen meet and form a plexus about the aorta at the caeliac axis and from this aortic or caeliac plexus, *two thoracic ducts*—right and left, arise. Each of these passes forwards towards the neck on each side of the vertebral column and along the lower face of the lung receiving the pulmonary lymphatics, receives before its termination the lymphatics from the head, neck, wings and anterior part of the body and terminates in the jugular vein or the anterior vena cava of its side. The two thoracic ducts are connected by a transverse branch about their termination.

The lymph glands are few and are found at the base of the neck, in the anterior part of the thoracic cavity and the walls of the alimentary canal. These glands are very small and are in the form of lymph nodules. In some parts of the body, these glands are replaced by plexuses of lymphatic vessels surrounding the large blood vessels.



Neurology

The nervous system in the fowl presents several interesting modifications.

The brain and the spinal cord are covered by the three meninges as in mammals. The pia mater is more delicate and the middle covering is rather scanty. The tentorium cerebelli is small.

The brain weighs about two and a half drachms in a medium sized fowl and consists only *three divisions.*—the cerebrum, cerebellum and medulla oblongata. The pos varolii which is well developed in mammals is either altogether absent or is represented by a few narrow oblique fibres.

The *medulla oblongata* bears a close resemblance to the spinal cord but it becomes wider as it extends forwards and is therefore wider than the spinal cord.

The *cerebellum* which is oval and elongated is situated on the medulla oblongata and contacts the cerebral hemispheres in front. Its lateral lobes are very small and conical. The cerebellum has, in its centre, a cavity which communicates with the fourth ventricle. The fourth ventricle is bounded by the cerebellum above and the medulla oblongata below.

The *cerebrum*, the largest of the three divisions of the brain is divided into two hemispheres each of which is pointed anteriorly. The hemispheres are applied to each other by flat faces. The fissure of Sylvius is shallow. The corpus callosum and septum lucidum are absent and the two hemispheres are connected together by a transverse band of nerve fibres - *the anterior commissure.* The external surface of the hemisphere is smooth and the cerebral gyri and sulci are therefore absent. The epiphysis cerebri-the pineal gland is small and is placed on the medium line at the posterior part of the longitudinal fissure and behind the optic thalami. The Olfactory lobes are small projections placed together in the median line projecting forwards between the anterior parts of the hemisheres. The lateral ventricles are well developed but are confounded with each other due to the absence of the corpus callosum and septum lucidum. The hippocampi are absent and the floor of each lateral ventricle is therefore entirely occupied by the corpus striatum.

There are twelve pairs of cranial nerves as in mammals and these resemble those of mammals in their origin and in a general way, in their distribution. The small differences that may be observed are due to the the absence of the pons varolii. These nerves are named as in mammals.

The ***spinal cord is small*** but it occupies much greater part of the vertebral column and extends from the foramen magnum to the coccygeal region. It does not form the cauda equina as in mammals but ends in a thread-like termination. It presents, as in mammals, two enlargements—the cervical and lumbar—which give off nerves for the wings and pelvic limbs. The two halves of the cord separate at the lumbar enlargement and join again at the sacral region to enclose between them an elliptical or diamond-shaped space—the rhomboidal sinus which is filled with a transparent gelatinous substance. The central canal of the spinal cord is more minute.

The number of spinal nerves depends on the number of vertebral segments. They are given off in pairs and are grouped as in mammals. The number of nerves of these groups are 15 cervical, 7 dorsal and 14 lumbo-sacral. The coccygeal nerves are there but they are not so developed as the others.

The brachial plexus is formed by the inferoir primary branches of the last three cervical (13th, 14th and 15th) and the first or the first and second dorsal spinal nerves. The branches of the plexus may be divided into

anterior and posterior groups. The anterior group represents the ulnar, musculo-cutaneous and median while the posterior group represents the radial, circumflex and other nerves.

The lumbo-sacral plexus is formed by the inferior primary branches of the last two lumbar and the first four sacral spinal nerves and may be divided into anterior and posterior parts. The anterior is formed by the last two lumbar and the first sacral nerves and supplies the crural, internal saphena and obturator nerves. The posterior part of this plexus is formed by a part of the first sacral and second, third and fourth sacral spinal nerves.

The Sympathetic System:

This system consists of two chains of ganglia extending along the vertebral column placed inferior to it. The ganglia are connected to each other by fibres to form a sympathetic trunk. Communicating branches—the rami communicantes arise from these and are connected with the spinal nerves. These chains are connected with the plexuses branches from which are distributed to the organs of circulatory, digestive, respiratory, urinary and genital systems.

THE ORGANS OF SPECIAL SENSE

The Skin and Its Appendages:

The skin, as in mammals is composed of epidermis and dermis. The skin of fowl is thin and does not contain sweat glands. The fowl is provided with a tail or rump gland—*the uropygial gland* (Oilgland). This gland which is placed above the coccyx and between the tail-feathers is peculiar to birds. It is a tubular gland and is round or oval in form. It is about the size of a pea and is divided into two halves by a median septum. This gland secretes an oily substance which is carried to the surface by a common duct. This duct passes through a teat-like cone which projects above the level of the skin and terminates. The fowl obtains some of this secretion by its beak and oils its feathers. This oil prevents the feathers from becoming dry or brittle.

The dermis is well developed and has dermal muscles which serve either for raising and lowering the feathers or for controlling the movement of the skin.

Thick epithelial elevations are developed on the surface of the toes where there is a great wear as they are in contact with the ground.

The stratum corneum is thick on the beak, upper face of the toes and the spurs. It forms scales round the nostrils, the base of the beak and the shank.

The epidermal appendages in the fowl are:—feathers, claws, combs, wattles and scales.

Feathers :

The skin is covered by feathers or plumage which is peculiar to this class. The feathers grow along in tracts *i.e*, along definite lines or areas. In other words, there is a space in which the feathers grow in definite rows and there are intervening spaces having no feathers. The epidermis on the feathered parts is thin and dry on the surface.

The feathers are of two kinds—the quill feathers and clothing feathers. A quill feather consists of two main portions (i) an axis or scapus and (2) vane or vexillum. The lower part of the axis is the *calamus* of quill which is rounded, transparent and hollow and contains a series of scales in the interior. The quill has two openings. The inferior umbilicus and superior umbilicus. The former is a small opening at its base and a papilla containing vascular pulp in young feathers projects through this opening into the interior of the quill. The superior umbilicus is also a small opening and it is found about the junction of the quill and the vane. That part of the axis of the vane—the central shaft or the midrib is the *rachis.* The quill is continuous with the rachis and the two together form the *stem* of the feather. The rachis is solid and presents four surfaces and four edges. It is elastic, tapers to the extremity of the feather and shows a longitudinal groove on that surface which faces the body. Its central core is in the form of a spongy material. The vane consists of two rows of slender, very flexible and pointed lamillae—the *barbs* which spring from the opposite sides of the rachis and project obliquely outwards towards the tip of the feather. Each barb bears two rows of smaller barbules (secondary barbs) which interlock with the adjoining or the opposite ones to make a feather's web. The root of the quill is provided with bundles of muscle fibres the contraction of which elevates the feather.

The feathers of the body vary in size. The largest and the longest of the quill feathers are those of the wing and tail and are termed as remiges and retrices respectively. Rows of small feathers—the covert feathers cover the bases of the quill feathers of the wing and tail and are known as wing coverts and tail coverts respectively. The smaller feathers on the remaining portion of the body are *contour* feathers. Still smaller ones under these are *plumules or down.* Smaller feathers than the plumules are called filoplumules.

The other appendages of the skin—the combs and wattles are the processes which are developed about the heads and are very richly supplied with blood.

The Organ of Vision or the Eye :

The lower eyelid is larger and more mobile than the upper. The third eyelid is well developed and is so extensive as to cover the front of the eyeball. The gland of the third eyelid is very often larger than the lachrymal gland. The conjunctiva is very delicate. The tarsal glands are absent. The eye-lashes are represented by minute feathers. The lachrymal gland is small and the lachrymal fluid is dischraged into the conjunctival sac by one or more excretory ducts.

The eyeball of the fowl is rather large for the size of its body and is only slightly movable, The orbital rim is incomplete. The right and left orbital cavities are separated by a partition—the interorbital septum and the two orbital cavities communicate with each other, in the dry skull, through a deficiency in this septum. The eyeball is strongly convex in front.

The eyeball is moved by four recti and two oblique muscles. The superior oblique muscle does not pass through a pulley.

The sclerotic has for its structure a layer of hyaline cartilage between two layers of fibrous tissue. The cartilaginous portion at its posterior part *i.e*, around the entrance of the optic nerve is frequently ossified to form an osseous sheath—*the posterior sclerotic ring,* around the nerve. *The anterior sclerotic ring* at the junction of the sclera and cornea is composed of bony scales which are capable of moving on each other and which serve for modifying the shape of the eyeball. The anterior chamber of the eye is large.

A vascular and pigmented structure which is folded in a fan-like manner and which extends from the point of entrance of the optic nerve into the vitreous humour—sometimes even forwards to the capsule of the lens, is called the *pecton.* This structure is considered as a part of the choroid.

The pupil is round. The iris is yellow in colour but may be dark or red in some. The lens is rather flat on its anterior face.

The Ear :

The ear in the fowl is divided, as in mammals, into external, middle and internal parts. The external ear is in the form of an appendage in mammals and such an appendage is lacking in the fowl. A fold of skin surrounding the external opening of the ear is called the ear lobe. This opening may also be surrounded or covered in part by a peculiarly formed tuft of feathers. Extending from this opening and terminating internally at the membrana tympani is the *external accoustic meatus* which is short and is lined with the continuation of the skin. The skin of the canal is continued to form a lining to the external face of the tympanic membrane. The external ear, in the fowl, is thus *represented only by the auditory meatus.*

Tympanum or *the middle ear* is formed as an irregular cavity in the temporal bone and communicates with the pharynx by the large osseous

Eustachian tube. The membrana tympani is thin. The auditory ossicles of mammals are represented in the fowl by a single bone—*the columella* which is in the form of a rod of bone stretching across the tympanic cavity. The external end of this bone is attached by a cartilaginous process to the internal face of the membrana tympani while its internal end which is disc-like is applied against the fenestra ovalis in labyrinthine wall. The columella represents the mammalian stapes and the cartilaginous process connecting it represents the mammalian malleus,

The labyrinth or the internal ear is also formed in the temporal bone and consists as usual of an osseous and a membranous part. These consist of the same divisions as in mammals. The semicircular canals are proportionately larger and thick-walled. The cochlea is not snail-shaped but is a short and slightly bent tube. It is not spirally coiled as in mammals.

ERRATA

Page 83.—7th line from bottom for ' skeletion ' read ' skeleton '.

Page 84.—8th line from bottom for " segment the *basi-hyal* ' read " segment is the *basi-hyal* ".

Page 88.—Para 3 from the top, last line " for these with the Metacarpals ' read " these fuse with the Metacarpals ".

Page 92.—8th line from the bottom for " the large consists of " read " the large intestine consists of ".

THE INDIAN VETERINARY JOURNAL

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THE

Indian Veterinary Journal

(The Journal of The All-India Veterinary Association)

Vol. XXII SEPTEMBER, 1945 No. 2

Editorial

THE WAR ENDS

AFTER six long years of untold suffering and destruction to countries and peoples, the Second World War has come to an end with the unconditional surrender of the Eastern Aggressor, Japan. The end has been quite sudden and abrupt, contrary to expectations. The Allied powers have deservedly come out victorious. They have won the war. And now commences the greater task of plannning and winning the Peace which we ardently hope will be a lasting one.

As everybody knows, this War has been a War of "Scientists" in which the scientists of opposing countries have vied with one another in inventing, counter-acting and perfecting weapons of destruction. The final round was won with the perfection of the Atomic Bomb. With this latest discovery, it is prophesied that mankind would work out its own destruction if ever there were to be another World War. And, therefore, in planning for the Peace we must aim at avoiding all Wars in future. Such a planning we are convinced, would be fruitful only if greater and greater attention is paid to the work on the land, to the extension of the plough and to the rehabilitation of the peasant in his pristine glory. An industrial policy is needed and is necessary for the country but it must be only secondary to a bold agricultural policy. This is the surest and safest method of ensuring the happiness and contentment of the country—not only of one country but of all countries—for therein lies the path to self-sufficiency

and self-reliancy and consquent non-aggrandisement. In this process of Post-war Reconstruction and rehabilitation, our profession, as the custodian of the livestock of the Farm, has a great part to play and we look up to the Government and to the leaders of the profession to see that the profession is not denied its legitimate share in its work and that on the other hand, it is given ample scope in the shape of Men, Material and Money so as to enable it to contribute its share to the economic prosperity of the land.

Taking a retrospect of these years of War, we may take pride in the fact that the profession, small as it has been, has played a noble part towards the successful termination of the War. The demand for more food followed by an intensive campaign of Grow More Food met with a ready response from the profession and it rose to the occasion by maintaining the livestock in a state of health, by reducing the incidence of contagious diseases and by increasing the production of more milk and meat to meet the requirements of both the civilian and military personnel. The response to the call from the Army for Veterinary personnel has been quite spontaneous and magnificent, as would have been seen by the list of enlistments published periodically in this *Journal*. In fact, the Civil Veterinary Departments were stripped to the barest minimum to meet the needs of the Army. In our own modest way, we have tried to bring out this *Journal* as regularly as possible and we give expression to a feeling of satisfaction that the INDIAN VETERINARY JOURNAL did not miss even one single number during the period of War. This has been possible because of the hearty co-operation of the members of the profession. We are thankful and feel highly grateful to them all. Our only wish is that such co-operation would continue and be forthcoming in more ample measures in years to come so that this *Journal* of theirs would be a living vital force in the land.

Plate No. XV Vol. XXII, No. 2

K. S. NAIR, G.B.V.C., M.R.C.V.S., D.T.V.M.,

Who has been appointed as Director of Veterinary Services, MADRAS.

Plate XVI Vol. XXII, No. 2

The late Sri Rai Bahadur

N. NALLATHAMBI SARKARAI MANRADIAR, Avl.,

Pattagar of Palayacottai, Coimbatore District, S. I.

(By the Courtesy of the "Hindu")

OUR SPECIAL NUMBER

AS announced already in our previous issue, this number of the INDIAN VETERINARY JOURNAL is devoted entirely to "POULTRY" and we are grateful to the various contributors who have so willingly and unreservedly placed their experiences at the disposal of the profession through the medium of this *Journal.* The articles that are published in this issue cover all aspects of Poultry Husbandry *viz.* Breeding, Feeding, Disease Control and also a special article on the Anatomy of the Fowl by that great anatomist Rao Sahib H. N. Chelva Iyengar. The importance of Poultry Farming, the pitfalls that are likely to be met with in the practice of it and the remedies, prophylactic and curative, that should be adopted in overcoming such pitfalls have all been dealt with from different angles and we hope that we have provided a substantial fare even to the exacting tastes of our readers. We very much like to follow this up by a periodical review of Poultry Farming in different Provinces so that the members may be kept correctly informed of the position of Poultry industry in this land. We commend this point to our readers.

A GREAT CATTLE BREEDER

WE deeply regret to announce the premature death of Rai Bahadur Nallathambi Sarkarai Manradiar, the Pattagar of Palayacottai, which took place in his home on the 27th of August 1945.

The Rai Bahadur, familiarly known as Palayacottai Pattagar, came of a family noted for generations for its interest in cattle and cattle breeding in Coimbatore District of South India. The famous Kangayam breed of cattle had been perfected even before his time, but it was solely due to his initiative, earnestness and enthusiasm that the breed became known all the world over. His Farm at Palayacottai is a model farm in many ways and it is an ocular proof of what one can achieve if only one had the love and zeal for his work. Many a visitor expressed admiration for the splendid way in which the animals are kept and maintained and it is

a matter for great sorrow that the Pattagar should have been snatched away so early in his life.

His life sketch is very interesting and we cannot do better than extract the following from our local contemporary, the Hindu of Madras :—

" Rai Bahadur N. Nallathambi Sarkarai Manradiar, popularly known as the " Pattagar of Palayacottai" was born on 30-12-1886 in a historic family of " Kongu Vellalas ". His ancestry is traced to 1000 B. C. In recognition of the help given to the Pandya kings by his forefathers they were awarded the title of *Uthama Kaminda* as well as powers to settle social and religious disputes in their community of Vellalas and their sub-castes. The Pattagar is one of the social and religious heads of the powerful Vellala community which is predominantly agricultural in the districts of Coimbatore, South Salem, North Madura and Trichy. The title of " Pattagar " is hereditary and passes on to the eldest son.

He had the distinction of being the biggest landlord in Coimbatore District and the biggest cattle breeder in India. His special breed of cattle is known as the " Kangayam Breed " which is well known for its hard working and enduring qualities and both the Government of Madras and the Government of Ceylon indent on the Pattagar for their requirements. His breed of cattle had been to Brazil, Washington, Newzealand, F. M. S. and Ceylon. In agricultural matters and in cattle breeding he was an authority being often consulted by the Government. As such his services to the country by the establishment of the " Kangayam Breed" are incalculable. The Royal Commission on Agriculture with Lord Linlithgow as the president has made specific mention of his efforts in their report as follows :—" We mention here The Pattagar of Palayacottai because his was almost the only herd which was brought to our notice as an outstanding example of careful cattle breeding ".

Governors of this province, Animal Husbandry Experts of the Imperial Government and visitors from India and abroad as England, America, Ceylon, etc., have appreciated the Pattagar's cattle Farm a great deal. Extracts of their appreciation from the Visitor's Book maintained at the Farm since 1904 are worth noticing.

Lord Pentland, a former Governor of Madras writes :—

" He is doing splendid work for the Farm Stock of the presidency, and in this he has my cordial good wishes. His example may, I trust, be followed by others. "

Sir George Stanley, another former Governor of Madras, writes :—

" I have never seen anything in any country to equal what the Pattagar was kind enough to show me to-day. His herd of cattle is quite unique and repays him for the immense trouble he has taken to improve the breed. I was particularly struck by the fine level of excellence he has attained and by the very healthy condition of the animals. It was altogether a most interesting experience and one that I shall not readily forget. "

Lord Erskine, another former Governor of Madras, writes :—

" I was delighted to have the opportunity of seeing the cattle this morning. They are splendid herd and I only wish that more cattle breeding on this scale was being done in other parts of the presidency. I sincerely congratulate the Pattagar on the great work that he is doing for the improvement of Livestock in South India. "

Col. Olver, Animal Husbandry Expert with the Imperial Government, has written thus :—

" As one who has always taken great interest in cattle breeding, I was much struck with the healthy condition of all the stock and the healthy conditions under which they are maintained.

It is very evident to anyone with a knowledge of Stock Breeding that the correct principles of breeding are adhered to and I feel that every possible use should be made of this carefully bred herd to improve the cattle of this area for which they are very suitable. "

He had a charming personality and was reputed to be a hard worker and an ideal landlord. About 600 labourers are working in his farm daily and they are fed free in the noon. His relation with his tenants and his workers was always cordial and in case of any special sickness or trouble to his tenants and workers the Pattagar was reputed to be fatherly and generous.

He was a popular figure, not only among his community, but in the whole district and India as well. He was simple, generous, kind hearted and most charitable. He was loved by one and all who came in contact with him.

In addition to his Estate management and cattle breeding activities he had a leading part in the public llfe. He was a member of the Madras Legislative Council representing the agriculturists in the Coimbatore District for a period of 12 years immediately after the introduction of the Montford Reforms. He was a member of the District Board, Coimbatore, from 1907 till his detah. He was the President, Taluk Board, Erode, for three terms successively, and President of the District Board, Coimbatore East, Erode, when the District was bifurcated. Ho was the President of the Temple Committee, Erode Circle. He was the President of the C-operative Land Mortgage Bank, Erode, from 1933, since its inception till his death. He was an honorary visitor to the Agricultural College, Coimbatore. He was a member of the All-India Cattle Show and Breeding Committe, New Delhi. During his term of office he had done much to the welfare of the rural population by the spreading of the Elementary Education in almost all the villages by opening schools, by improving the village communications, by providing drinking water facilities, by digging wells and by improving the cattle wealth of the ryots by the distribution of pedigree Bulls.

Being the religious head he had done valuable service to the Tamil Literature also by compiling, editing and publishing ancient Tamil works as "Kongumandala Sathagam", "Sivanmalai Puranam," Sivanmalai Kuravanchi," "Kadhal" and "Mangalavalthu", etc.

His death is a great loss to the community and to the country as a whole. He leaves behind his wife, two sons, five daughters, sons-in-law and a host of friends and relatives to bemoan his loss. His loss to the country is irreparable.

His eldest son is Sri N. Nallasenapathy Sarkarai Manradiar Avl., who succeeds him as "Pattagar" and his second son is Mr. Arjunan.

Both are the worthy sons of their father who will follow their father's footsteps and will keep up the traditions of the family.

His eldest son-in-law is Sri Agathur Muthu Ramaswamy Kalingarayar, Zamindar of Uthukuli, Coimbatore District, who is a descendant of one of the ancient noble families in the District.

May the soul of the departed rest in peace."

POULTRY FROM THE ARMY POINT OF VIEW

By

Major H. W. Cole,
D.A.D.S. (DEV)., Southern Army.

The rearing of poultry as it is now being undertaken by the Army is perhaps on a far larger scale than has ever been undertaken before in India, and has produced many problems not before found, owing to the large scale under which poultry have to be produced to make an issue to troops as it is useless to issue at all unless you can issue enough at a time to go the whole way round. You cannot feed half a unit on chickens and the other half on some other commodity.

As in all Army Development, the breeding stock has got to be such that the mere thought of importing enough breeding stock is out of the question so the country hen is being used. First it is crossed with a white Leghorn Cockerel and the up-graded pullet from this cross again crossed with a heavy cockerel, usually a Rhode Island Red. It has been found that the heavy cockerel will not produce good results from a first up-graded cross with a country hen as she is very much too small for him.

Incubation has of course been a very great problem, as incubators apart from being ridiculously expensive have also turned out to have been of very inferior manufacture and results have therefore been very bad, the "Silver hen" is a very successful incubator but the demand has been so heavy that it has been found utterly impossible to get them in sufficient quantities. At an Area Development Farm at Aundh near Poona, Army Development have for over six months been making their own incubators and capsules and the results have been very successful and have produced an average 85% hatch excepting during the hot weather when the incubation has dropped to about 65%. These incubators are 355 egg size and the Farm is turning out one per day complete, using its own labour supervised by a B.O.R. The materials, used have been mainly of salvage, the water pipes made from Ghee tins, also the lamp fixtures etc., and the timber from old army lorry bodies.

Brooders have also been made from Army lorry bodies, and quite successfully but only as a temporary measure as they are addicted to ticks and the only answer to that is naturally faced concrete.

Turkeys, Geese, Guinea Fowl and Ducks are also being reared very successfully in large numbers and on one Army Development Farm at Vakad near Poona there is one flock of laying ducks numbering 12,000,

these ducks are on the river all day in charge of four coolie women, two each side of river at each end of the allotted area, they come in at night and are laying an amazing number of eggs daily.

Army Development is launching out with rabbits and pigeons in a very big way for hospital issues and a lot of English bred rabits will shortly be used to up-grade country stock.

THE PROBLEM OF POULTRY MORTALITY

By

A. J. Macdonald,
Officer-in-charge, Poultry Research Section, Imperial Veterinary Research Institute, Izatnagar, U. P.

The poultry industry in India is very undeveloped despite the fact that it is the home of the Red Jungle Fowl (*Gallus bankiva*) from which all our modern breeds of poultry have been developed. The backward state of the poultry industry is due to various factors, such as poor foundation stocks, lack of knowledge in regard to methods of production, prevalence of poultry diseases, lack of demand for poultry products and low purchasing power of the population.

India prior to the war used to be practically self supporting as regards eggs and poultry. However, the total production in comparison wiih the total population was small, the average annual per capita consumption of eggs being only eight. In most other countries the average annual consumption is around 150 and in the U.S.A. and Canada the figure is over 300. From the purely nutritional aspect it is exceedingly important that the production and consumption of eggs should be increased manyfold, for eggs are exceptionally rich in well-balanced proteins, minerals and vitamins all of which are deficient in the normal diet of the people.

Prior to the war practically all the production came from small units of about 10 birds, the majority of which were kept under ordinary village conditions. However, on account of exceptionally heavy demands from the defence services, especially, the hospitals, for eggs and poultry the supply position is now most unsatisfactory and strenuous efforts are being made to improve production by the establishment of a large number of large-scale commercial units. Village producers are also being encouraged to keep more birds and large numbers of improved breeds are being distributed under village conditions.

It is difficult to get accurate data in regard to the actual losses experienced under village conditions of poultry keeping but from the

limited data available it is evident that losses from various causes are very high. Losses from disease epidemics are also frequently very high on specialized farms.

Under village conditions losses in rearing from 0-6 months are generally around 40-50%. These losses compare most unfavourably with those experienced in other countries where the losses experienced during the same period do not usually exceed 20 per cent. One of the primary causes of high mortality in very young chickens is poor nutrition. The period from 0-8 weeks is by far the most critical in the life of the chicken and much wastage could be prevented by feeding better balanced foods during this period. As the total food consumption up to 8 weeks is only about 4 lbs. per bird the extra cost of feeding a well balanced diet would be more than compensated for by better growth results and lower mortality. The inclusion of some form of animal protein, such as separted milk, buttermilk, meat offal, fish etc. along with succulent green food and calcium would help to ensure against losses from faulty nutrition.

Animals and wild birds take a very heavy toll of young chickens. As it is impossible to safeguard against losses from birds if the chicks run about with the mother hen, losses can only be prevented by some form of semi-confinement. Losses through attacks by jackals, rats etc. are also heavy amongst birds of all ages.

Practically no information is available in regard to the losses from coccidiosis under village conditions of rearing. Under specialized conditions caecal coccidiosis is a major cause of loss in chickens up to 8-10 weeks of age. The duodenal types which are common in older birds in western countries seem to be less important. Caecal coccidiosis is especially common in wet weather which favours the development of the coccidia outside the body of the host. Attacks can usually be cleared up by daily cleaning of the litter and equipment as this removes the oocysts which do no damage to the stock when picked up within 36 hours of being excreted in the faeces. Recent literature suggests that good results can be obtained by treatment with certain of the sulpha drugs but this treatment is expensive and the drugs are practically non-obtainable at present.

Under purely experimental conditions birds can be successfully immunized against any species of coccidia. In this method of control immunity can be built up by giving birds graduated doses of coccidia over a period of 7-10 days. This method of control is still far from satisfactory for field conditions for no standard immunisation dosages can be worked out as the resistance of the stock varies very considerably with different environments. It must also be remembered that immunity to each species of coccidia must be built up separately. Under normal field conditions fairly good results can be obtained by strict attention to hygiene during the

brooding period and subsequent rearing on clean soil. Chicks of different ages should always be reared in different lots and on no account should young chickens be allowed to mix with birds which have previously suffered from coccidiosis.

Fowl pox is another disease which is very prevalent throughout the country. In adult birds fowl pox may not cause very much mortality but it nevertheless does very considerable damage through loss in production. In young birds fowl pox may result in a mortality of well over 50 per cent. In a typical outbreak of fowl pox the disease is characterized by pox nodules on the comb and wattles. However, in some outbreaks these symptoms are rare or absent and the only symptoms may be cheesy patches on the mouth and throat together with swelling of the eyes and a watery discharge. Fowl pox can be differentiated from coryza (roup) by transmission experiments. Somewhat similar conditions as those found in roup are also found in advanced cases of vitamin A deficiency. In cases of vitamin A deficiency the disease may be distinguished by the presence of numerous pinhead, yellowish white spots in the mouth and throat and the absence of vitamin A in the liver.

Fowl pox can normally be prevented by vaccination. In India the vaccine is made from pigeons and immunity lasts for about six months. On commercial farms vaccination at 8 weeks and 24 weeks is recommended as a fairly safe method of control for birds treated in this way seem to retain sufficient immunity to prevent serious losses at any subsequent stage. The results of experiments on the use of fowl pox in very young chickens suggest that the immunity given is very slight and in most cases infection of young chickens can be prevented if all the older stocks are rendered immune.

Tick fever is another disease which causes very heavy losses amongst all classes of stock except in South India where the condition is rare or absent. The presence of ticks (*Argus persicus*) is often overlooked, because the adult tick attacks the birds only at night. The veterinarian should remember that the spirochaete transmitted by the tick can only be demonstrated in the blood during the height of fever. Birds affected by tick fever can be cured by an intramusqular injection of soamin or sulfarsenol. Recovered birds are permanently immune. Birds can also be protected against tick fever by injecting affected blood and giving a curative dose about 48 hours later.

Control of the ticks themselves is by no means easy for it is difficult to destroy ticks which remain hidden in deep crevices. In metal houses good results can be obtained by burning considerable material inside the house. In *pucca* buildings, periodic blow-lamping and thorough spraying with kerosene, preferably under pressure, will give good results. In houses

built of mud or mud plastered it is advisable to move the birds to fresh premises and destroy the affected ones.

Birds frequently get infected with ticks and tick fever during railway journeys. As the introduction of infected birds may introduce disease into healthy stocks it is sound policy to isolate new birds on arrival in broody coops for 10 days. Thereafter it should be safe to run the fresh stock with other birds as any seed ticks which have been picked up enroute will have left the birds.

Prior to the first outbreak of Ranikhet disease, diagnosed at Ranikhet in 1927, veterinary reports frequently reported outbreaks of fowl cholera. It is now known that fowl cholera is not nearly so common as formerly reported but odd outbreaks are occasionally reported from different parts of the country. It would appear that the disease is present in an endemic form and that the causative organism may be present in a carrier form in many flocks. These carrier birds may prove a source of danger, for if the condition of the stock is lowered the disease may flare up and cause heavy losses. In suspected cases of cholera blood for examination sdould be collected under sterile conditions from the heart blood of birds immediately after death.

Much work requires to be done in regard to the prevention and control of cholera for the present system of vaccination and sérum inoculation does not seem very satisfactory. As treatment of affected birds is not satisfactory early steps should be taken to prevent the spread of infection. Any pen found infected should be immediately quarantined and all sickly birds destroyed. The houses and equipment should be thoroughly cleaned daily and potassium permanganate placed in the drinking water until such time as the trouble completely disappears.

Ranikhet disease has in recent years, received more prominence than any other poultry disease. It is impossible to assess the total annual losses from Ranikhet disease for a large number of the reports of outbreaks received are from cities and their neighbourhoods and as these areas only contain a small fraction of the total fowl population it is dangerous to assume that their losses are representative of the whole country. It appears that the incidence of Ranikhet is higher in populous areas due to the fact that there is a bigger movement of stock which is conducive to the spread of infection. Furthermore, it must be remembercd that the public are very Ranikhet-minded and that losses from any other highly fatal disease tend to be classified as an outbreak of Ranikhet.

In diagnosing Ranikhet in the first instance, care should be taken to eliminate all possibilities of death from fowl cholera and tick fever. Final diagnosis, however, should rest on the biological test on immune and non-immune birds.

As the results of many years of intensive work at the Imperial Veterinary Research Institute we can now look forward to an era wherein the commercial poultry farmer can have all his stock permanently immunised against Ranikhet disease. The preparation of a a vaccine on developing egg embroys has passed the stage of laboratory experiment and many thousands of birds have been successfully immunised. A small percentage (2-3 per cent) of immunised birds have to be destroyed for table purposes as they lose the power of their limbs but this is a small price to pay for immunisation of valuable stocks. One of the difficulties involved in the field use of the vaccine is its perishable nature at room temperature. Effective control therefore, must depend upon the establishment of storage depots at different centres throughout the country.

Ranikhet disease is largely spread through the purchase of birds which have the disease in the incubation stage. The poultry markets are a hot bed of infection for many producers rush their stock to the markets as soon as the first signs of infection are noticed. In poultry farms the disease is frequently introduced through the importation of broody birds for hatching purposes. Stock birds which have travelled on the railway may also introducc infection as they often pick up the disease from contact with infected birds in the railway carriages or at railway stations. In order to prevent such occurrences all new stock should be quarantined for 10 days on arrival.

A number of cases of fowl paralysis (*neurolymphomatosis*) have been diagnosed from widely scattered parts of the country. So far as is known the total losses from the disease in India are light but with the rapid expansion of commercial poultry farms it is possible that the disease may eventually become of tremendous economic importance. In many countries fowl paralysis causes exceptionally high losses and every effort should be made to prevent its spread.

Despite intensive research in other countries no method of treatment has yet proved successful. Little is known about the method of infection and as far as is known the stock gets infected through coming into contact with infected stock or premises. Young chicks are very susceptible and adult birds are relatively resistant to infection. The first symptoms are not usually seen until the birds are 10 weeks old even though the infection was picked up very early in life. On an infected farm losses are high between the ages of 3-12 months and outbreaks occur year after year with unfailing regularity.

On farms with no previous history of infection every possible precaution should be taken against the introduction of the disease through the importation of stock from infected sources. There is also a good deal of evidence to suggest that eggs may carry the infection but this theory is

still open to contention. On infected farms rigorous culling and breeding from lines which are relatively resistant to the disease will materially lower losses.

Ducks are generally regarded as more resistant to disease than fowls. As regards certain diseases such as Ranikhet disease and coccidiosis this generalisation holds good but, nevertheless, the recent efforts to increase duck production have shown that heavy mortality amongst ducks is all too common when they are kept in large flocks on relatively small areas of land. Under artificial conditions of rearing keel disease may cause heavy losses in young ducklings aged one to three weeks. Treatment of the affected birds is useless and successful control can only be obtained by blood testing and removal of the carrier birds which transmit the disease through the egg, as in B.W.D.

Effective control of the various poultry diseases in a vast country like India is a tremendous task, for many diseases are well established, and in view of the scattered nature of production and lack of knowledge of the producers, control measures are more difficult to apply than in countries where the poultry industry is well developed. In a country like England Ranikhet disease has been most successfully controlled by a slaughter policy but this is not practicable here in view of the widespread distribution of the disease and impossibilities of gaining the full cooperation of the producers.

Lack of trained personnel in regard to diagnosis and control of poultry disease is also a limiting factor as regards reducing poultry mortality. In addition to training far more veterinarians in poultry diseases it is necessary to train poultry husbandrymen in large numbers, for good housing, management and feeding are most essential factors towards reducing poultry mortality.

FINAL PROGRESS REPORT OF THE SCHEME FOR RESEARCH INTO THE DISEASES OF POULTRY I.V.R.I. IZATNAGAR *
(10-2-1939 to 14-4-1944)

Abstract of Results having practical application.

The scheme was sponsored by the Imperial Council of Agricultural Research with the object of training scientific personnel undertaking a country-wide survey and conducting intensive research on the control and eradication of poultry diseases in India.

I Training.

The officer selected for this scheme was sent to the United Kingdom to undergo specialist training in Poultry Pathology and Husbandry for a period of two years. On returning to India he has helped to train a team

* From I. C. A. R., New Delhi.

of workers, now working on poultry diseases in the various provinces and states. These workers keep in close co-operation with the Central Laboratory.

II Survey

The states of Mysore and Hyderabad and the provinces of Madras, Bombay, C.P., U.P., Bihar, Orisa, Punjab and N.W.F.P. were visited to obtain first hand information about poultry diseases.

The main conclusions from this survey are :—

(a) In order of seriousness, the predominating diseases affecting poultry are Ranikhet disease, fowl pox, spirochætosis (tick fever) and coccidiosis.

(b) Contrary to common belief epidemics of fowl cholera are rare.

(c) *Salmonella pullorum-gallinarum* infection (pullorum disease and fowl typhoid,) are either very rare or absent in this country.

(d) The existence of avian leucosis complex (fowl paralysis) has been definitely established in widely separated localities.

(e) Fowl ticks were common all over Central and Northern India but were rare in the South. They were found all the year round, but were most active after the summer rains. All ticks collected from different parts of the country, were identified as *Argas persicus Oken.*

III Research.

1. *Ranikhet disease.*—The most outstanding result has been the elaboration of a technique for the active immunisation of fowls against Ranikhet disease. By successive passages of virulent virus on the chorio-allantoic membrane of the developing chick embryos, an attenuated virus can be produced which is fully antigenic. An English strain, so attenuated was used with 100 *per cent* success as a vaccine and the immunity induced was durable. Unfortunately on account of slow transport facilities due to war conditions, this strain was lost during transit to India.

Further work with three Indian strains has revealed marked differences in their amenability to attenuation. Sixty-nine and thirty-two passages respectively failed to attenuate strains 1 and 3; strain No. 2 was, however, definitely attenuated after 19 passages and remained avirulent for fowls for a number of passages, the avirulent virus capable of immunising fowls against the disease. In later passages, however, this strain gave paradoxical results indicating the necessity of further work before this attenuated virus could be successfully employed as a vaccine. In view of the difficulties in

carrying out Ranikhet disease work in conjunction with other disease investigation, it was decided to hand over further work on Ranikhet disease to the Pathology and Bacteriology section of the Institute.

Contrary to previous reports, ducks (pennine) proved insusceptible to experimental infection with Ranikhet disease, but work with other breeds is needed to confirm this.

A successful attempt was made to breed fowls resistant to this virus. Chicks hatched from eggs laid by two hens naturally resistant to the virus were shown to be resistant to an experimental infection which proved fatal to controls. A genetical approach to the control of this disease has evidently possibilities of far-reaching importance.

2. *Fowl pox.*—Epizootiological studies revealed that the disease occurs all through the year and affects fowls of all breeds. Chicks were more susceptible than older birds. Birds which recovered from the disease were not capable of transmitting infection. All strains collected from the field were found to be immunologically identical.

The practical value of pigeon pox virus, as a vaccine in controlling this disease has been extensively investigated. A total of 2793 birds of different breeds and ages were vaccinated and the results recorded. The feasibility of vaccinating day-old chicks was investigated. The results revealed that there was scope for the improvement of the vaccine used in this country and work in this direction is in progress.

3. *Avian Leucosis complex.*—A total of 154 samples of morbid materials collected from all over the country were examined histologically. In the course of the survey all the known manifestations of the disease (visceral, neural, ocular and bone) were diagnosed. Cases were met with in Bombay, Punjab, Hyderabad-Deccan, U. P., Cochin, Mysore, Madras and C. P. All breeds including the *Desi* were affected, but as the survey was mainly confined to organised poultry farms stocking primarily the exotic breeds, the extent of its infection in villages is not known. Its existence warrants further survey work, for its presence constitutes a serious threat to the industry as the disease is responsible for heavy losses in other countries.

4. *Fowl cholera.*—Epizootiological studies indicate that contrary to common belief the incidence of fowl cholera is rare. The disease is usually endemic in Nature and the organisms responsible for outbreasks are of the low infectivity type.

Studies on the viability of fowl cholera organisms (*P. aviseptica*) have indicated that the present technique for sending materials to the laboratory is not entirely satisfactory. Glycerine even in one per cent concentration was found inimical. Contaminating organisms were quickly lethal and

summer temperatures hastened the death of *P. aviseptica* in morbid materials. Femur packed in wood charcoal powder was found to yield satisfactory results; at 20-30°C the organisms remained viable for as long as forty days.

Detailed investigation was undertaken into the carrier problem in the spread of this disease in a flock where fowl cholera was endemic. In an examination of the flock soon after an outbreak, both virulent and avirulent organisms (*P. aviseptica*) were isolatad from the respiratory tracts of apparently healthy fowls. Some of these carriers were detected in pens where no case of the disease had occured. Twenty-one months after this outbreak *Pasteurella* carriers were again detected in the flock. These findings indicate the necessity for control by the detection and elimination of the carriers.

Interesting observations were also made on the role of avirulent *Pasteurella* isolated from healthy fowls. Passages of these organisms through fowls caused no enhancement in virulence. Increase in virulence was, however, noticed after passages through pigeons or rabbits. A single passage through crows greatly increased the virulence. The results suggest outbreaks may occur through wild birds like crows picking up mild infection and passing it on to fowls in an exalted form.

A good deal of work was also done on the elaboration of a satisfactory vaccine. No useful results were obtained with cultures of the available strains of *P. aviseptica* grown on various liquid and solid media treated with formalin, phenol, crystal violet, glycerine and chloroform. Similar results were obtained from tissue vaccines. Inoculation of fowls with a strain of *P. boviseptica* was, however, found to confer a solid immunity. Further research along this line of work is very essential.

5. *S. pullorum-gallinarum infection.*—Work was done on the standardisation of an antigen for the rapid whole blood, stained antigen method for the diagnosis of this disease in adult stock. This antigen was supplied to the Assistant Disease Investigation Officers so that they would collaborate in the survey of this disease.

A total of 5017 adult fowls from 23 different flocks (of this 1219 done by A.D.I.Os) all proved negative for the infection. As no confirmation of the presence of the disease could be obtained it is concluded that this disease is either very rare or absent in India.

6. *Ticks.*—The control of seed ticks (larvae of *Argas presicus Oken*) by the application of kerosene in linseed oil; pyrocide 20-sulphur; iodoform and ash or boric acid; neem oil; naphthalene; and methylated spirit was investigated. Most of these were helpful in the control of seed ticks.

Derris root powder in 10 per cent aquoeus suspension recommended as a tickicide was found unsafe for chicks under 5 weeks old. The toxic effects were in proportion to the extent of body surface covered.

7. *Miscellaneous conditions.*—Cases of tuberculosis, streptococcal infections, infectious coryza, a variety of tumours, coccidiosis, blackhead, egyptionellosis, favus and infestations with lice, mites, fleas and helminths were diagnosed. More work on the incidence and losses from these diseases is required.

THE PRESENT POSITION OF THE POULTRY INDUSTRY IN HYDERABAD STATE

By

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Introduction—Of the total number of 522 lakhs of laying fowls in India, nearly 90 lakhs are maintained in Hyderabad State. Among the Indian states, Hyderabad produces the largest number of eggs, about 2,000—2,500 lakhs every year. The pre-war annual value of the exported fowls to Bombay in 1928 was estimated at about Rs. 48,100 (Hyder, N. 1933). The poultry industry is therefore one of the lucrative trades in the state; but it is in the hands of laymen who conduct this without any system or scientific principle.

Poultry livestock

1. *Fowls.*—There are two types of fowls kept in the H.E.H. the Nizam's Dominions (1) Desi fowls (2) Improved fowls. The desi fowls are the indigenous fowls whlch are ubiquitous all over the country. Among the indigenous types of fowls the pristine breed of Hyderabad Aseel is famous on account of its enormous size, body weight, vigour and stamina. But this breed is slowly diminishing in the state owing to various causes. The other type of birds are White Leghorns, Rhode Island Reds, Black Minorcas and Plymouth Rock etc. They are imported from abroad bred and acclimatised in the Dominions. The dissemination of improved stock is carried out by the Government Poultry Farms that are stationed at Himayatsagar, Parbhani and Patencheru.

(2) *Ducks.*—Duck breeding is also one of the important industries in the state. Of the total duck population of 166 lakhs in India, the estimated number of ducks in the Dominions is about 0·07 lakhs. Duck rearing is popular only in Hyderabad city where the river Moosi and drainage nala of Amberpet are utilized for this purpose. The prompt sale of ducks and their eggs and the natural resistance of these birds to contagious diseases are the

chief reasons for the preference of duck raising to poultry keeping in the city. Flocks of 200-500 ducks are maintained by the poor class of people for purpose of trade. Among these flocks three breeds are discernible. They are (1) Hyderabad Breed, with a small body and neck, slow in movement and poor layers. (2) Madras breed, larger in size with a long neck and fairly active. (3) Muscovey type generally known as Mamola, is rather rare (Mohteda S.N. 1944).

Poultry diseases.—Poultry diseases are one of the economic problems of great importance in India. According to the report on the Marketing of Eggs in India (1938) economic loss sustained through poultry diseases is about 33-50% of laying birds which have to be replaced every year. Realising the necessity of investigation of poultry diseases, H. E. H. the Nizam's Government have sanctioned a joint scheme in collaboration with the I. C. A. R. in the year 1941. The object of this scheme is to record the incidence and prevalence of contagious, parasitic and other diseases of poultry together with methods of their prevention and treatment.

The survey of poultry diseases carried out in the Dominions in the past three years has brought to light that among the contagious diseases of poultry Ranikhet disease ranks first. It is prevalent in almost all districts of the Dominions causing about 80—90% mortality. It is also reported from every part of India and is therefore an All-India problem. Owing to devastation caused by this disease, serious attention is being paid by the I. V. R. I., Mukteswar regarding its control. The results obtained so for suggest that it might soon be possible for them to market a cheap and reliable vaccine which renders fowls immune against this dreaded scourge (Minett, F. C. 1942). The release of Ranikhet vaccine appears to be an urgent necessity. This will not only check the infection in the field but will also create confidence among the flock owners aud encourage them to take up this industry on a large scale.

Besides this common and important disease of poultry other contagious diseases are, Fowl pox, Pigeon pox, Coccidiosis, Avian leucosis complex, Spirochætosis (Fowls and geese), Fowl cholera (Ducks), Tuberculosis (geese), Salmonellosis (ducks), Egyptienella pullorum, Trichomoniasis and Rous Sarcoma No. 1.

Yet a group of poultry diseases are those caused by the deficiency of minerals and vitamins in feed. The importance of proper nutrition has not been recognised by the people. Jowar forms the staple diet of poultry which is insufficient with respect to various dietary requirements. Deficiencies in feed giving rise to conditions such as Leg weakness, Polyneuritis, Nutritional Roup, Laying of soft shell eggs, Feather pecking and Visceral gout etc, are often met with and their remedies embody the principles of feeding, housing and management.

Infestation with endo and ecto-parasites is a great menace to poultry due to free range system extenslvely practised all over the country. Elimination of these pests plays an important part on successful poultry farming.

Considerable importance is being attached in recent years to ameliorate the present plight of poultry. This will ensure its right place in the post-war reconstruction as an adjunct to successful agricultural enterprise.

Acknowledgement

I am very thankful to Mr. K. Raghavachari, G.M.V.C., Veterinary Investigation Officer, who has very kindly gone through this article.

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THE PRESENT POSITION OF THE POULTRY INDUSTRY IN INDIA

By

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Though the origin of the poultry in all parts of the world is from the Eastern Asia from the Indian jungle fowl, poultry farming may be said to be the neglected part of agriculture in India. No attention has been paid, till recently, to any branch of poultry production or marketing. As in other countries specialised poultry farming is not existent in India. Poultry in India includes Desi fowls, improved fowls,ducks, geese, turkeys and guinea fowls. The term Desi is used in regard to all indigenous fowls, although they have certain breed names as Tenis, Chittagong, Asils, Ghagas, Lolab, Karaknath and cross-bred. The term 'improved' is applied generally to pure.bred fowls (such as white leg-horns) imported from abroad or bred and acclimatised in India. The number of pure-bred fowls in India is so small compared to the Desi fowls, that unless there is a strict control in the villages, the cross-bred progeny in one or two generations invariably reverts to the Desi parentage.

For comparison of the fowl population of other countrice with that of India, the following table gives the figures :—

		Total fowls. (*in Lakhs*)	Laying hens (*in Lakhs*)
Asia excluding India and Burma	...	5,880	4,327
U. S. A.	...	4,261	3,699
Europe	...	3,419	1,818
Africa	...	64	144
Canada	...	530	245
S. America	...	43	33
India	...	1,732	522
Burma	...	34	9
	Total	16,510	10,97

It may be seen from the foregoing table that India has about 10½ per cent of the total number of fowls in the world.

Non-layers (cockerls and chickens) : the number of birds other than pullets and hens depends upon various factors. For instance, the number of chicks and chickens, soon after the main hatching season is considerably greater than other birds, but the proportion gradually decreases. In this country, there are 1,196·6 lakhs of non-laying Desi fowls, in other words, there are, for every laying hen 2·3 other birds.

Total Poultry in India

		Laying birds (*in lakhs*)	Other birds (*in lakhs*)
Desi fowls	...	514·7	1,196·6
Improved fowls	...	7·3	14·1
Ducks	...	54·8	111·5
Geese	...	1·6	0·8
Turkeys	...	0·1	0·07
Guinea fowls	...	4·2	2·2

The estimated value of the total poultry in India is Rs. 7·6 crores.

Ducks

The population of ducks including the non-layers in some countries of the world is given below :—

		In Lakhs.
Europe	...	122
North & Central America	...	7
China	...	567
Other Asiatic countries	...	25
Africa	...	5
India	...	166
Burma	...	20

From the above figures it would be seen that India and Burma contain about one-fifth of the world's duck population, and excluding China, they possess more ducks than all the other countries put together. Ducks by nature

are semi-aquatic birds and prefer wet and muddy conditions like tanks, river banks, creeks and deep paddy fields. They thrive in areas where they have free access to mud and water or can pick weeds, plant roots, fish and crustaceans. It may be said that ducks in India are much less susceptible to poultry diseases than the fowls. The ducks also lay more and larger eggs. For example, the weight of 53 eggs laid annually by a hen would be about 5 lbs compared with 90 eggs laid by a duck which would weigh 12·5 lbs. or about 2½ times the weight of hen's eggs. The total number of laying ducks in India is estimated to be 54·8 lakhs and the number of non-layers (drakes, ducklings) is 111·5 lakhs. Ducks are thickly populated in Travancore, Madras, Bengal and Burma.

Geese, Turkeys and Guinea Fowls:—These are found to exist in a few areas and the estimated number of laying geese and turkeys is 1·57 lakhs and 10,500 respectively. Geese are found mostly in Bengal and Bihar. Geese and Turkeys are generally reared to meet the demand for table poultry, particularly during Christmas, and are seldom maintained for production of market eggs on account of the special attention and heavy feeding that they require, together with the fact that they lay relatively few eggs per annum.

Guinea Fowls:—The population is estimated to be about 4·2 lakhs of which about 3·7 lakhs are in the United Provinces. Guinea fowls are generally kept for table use as well as for production of market eggs.

Distribution:—The main areas of concentrated production are Eastern Bengal, Travancore and Cochin States, the Godavari Delta of the Madras Province, N.W.F. Province, the Thana District of the Bombay Presidency, parts of Nizam's Dominions and the United Provinces. In sparcely populated areas as S.E. Punjab, Rajputana, Central India, Sind, Assam and W.I. States, poultry is not fairly well distributed.

Average Number of birds per village:—The average number of poultry kept in villages varies in different provinces and states. The number ranges from 102 in the Central Provinces to 1985 in Cochin State. The All-India average is 286 birds per village.

It will be difficult to say, in the absence of any investigation, if conditions in the villages are good enough to provide sufficient and proper natural food for the present number of fowls to enable them to maintain a normal rate of growth or to produce eggs to the maximum of their inherent capacity. The number of birds kept in a village largely depends upon the class of population viz. Muslims, Christians, etc., as the keeping of poultry is mostly confined to these.

There is also another aspect of feeding of birds and production of eggs. A bird must have a balanced ration to enable it to lay normal eggs that can hatch into chickens. Since the percentage of hatchability in villages is as high as 75, there seems no doubt that the birds are getting normal balanced food, which

may be attributed to the instinct and the industrious habits of the birds that help them fo prooure for themselves sufficient and proper food. It is therefore, desirable that experiments should be conducted in the villages to study the potentialities of increasing the number of birds, and consequently the production of eggs in each village without incurring any considerable expenditure on hand-feeding or raising the cost of production of eggs.

Method of Poultry Keeping.—Poultry keeping is usually confined to certain castes as Mahomedans and Christians. Specialised poultry farms as found in the European countries are practically not known in this country. The economics of running a poultry farm as a sole means of sustenance is also not known. Fowls are kept under the most primitive conditions of housing, feeding and management. Birds are housed in overcrowded, dark, ill-ventilated, unhygienic mud chambers, although they provide some protection from their enemies. With the exception of poultry farms maintained by Government and Missionaries, hatching and rearing of chicks are done entirely under hens. The Chinese method of artificial hatching under warm paddy husk is not practiced in India.

Feeding.—Very young chickens are fed extra supplements of small grains during the first four weeks and, thereafter are mainly allowed to feed for themselves and pick up whatever foods are available. Losses in rearing due to accidents, disease, malnutrition, predatory enemies like crows, kites, jackals, etc., may be about 50%. Sometimes hens when they are in the lay are fed with a few handful of grains by the house wife. Only those persons who keep Desi cocks for sport (cock-fighting) feed such birds with nutritious food.

India produces about 33,648 lakhs of eggs and Burma about 1,636 lakhs every year. If these eggs are all put end to end, they would stretch about 4 times round the world.

Egg Production.—The average annual egg production in India per bird is 53, when compared to other countries where the average per bird is 126. The size is also very small and is about 2/3 of the size of those of the western countries where modern methods of egg production are practiced. The causes of this low production may be attributed to poor stock, bad housing and management, malnutrition and disease. Improved hens bred from imported stock lay on an average 103 eggs a year. The number of such birds is small and does not exceed 1¼% of the total laying birds. Although this low production of the Desi hen might appear to be not an economic proposition, this is not true, as the production costs are so low that most of the money received from the sale of birds and eggs is pure profit. The amount of experimental work done on Farms in connection with Desi fowls is indeed very small. However, it would appear, from the small amount of experimental work carried out so far, that by proper management and selection, the output per bird can be increased by about one-third in a short time. The average egg yield for the duck per year in India is 90. About 50% of the laying fowls have to be replaced every

year due to disease mortality. Producers put on the market about 60% of the hen eggs and 80% of the duck eggs and retain only about one-fifth of the eggs produced. The average weight of a desi hen is 3 lbs. and her eggs 7¾ to 9 lbs. per 100 eggs, whereas, the average weight of the improved hen's eggs is 12 lbs per 100 eggs. The duck's eggs are much larger and the weight per 100 varies from 10½ to 17 lbs. Considering the higher yields and larger size of the egg of the duck and the immunity of the duck to most of the diseases, it is very unfortunate that nothing has been done to improve ducks by selection and thereby increase the production.

Utilisation.—In India the position is quite different from other countries, since the bulk of the people are vegetarians and the average egg consumption per capita is only 8 eggs per annum. But in non-vegetarian countries, eggs form a regular part of the diet and the rate of consumption per capita is very high; for example, it is 283 in Irish Free State, 260 in Canada. 236 in the U. S. A., 158 in the U. K. and 114 in Germany. Eggs are used for household use, for confectionary and industrial purposes such as glazing, book binding, tanning, varnishes and preparations of medicines. Over 95% of the eggs consumed in this country are used for table and cooking purposes. Preparation of industrial egg products as frozen, liquid or dried yolk or whites has not been done in India.

Demand.—Although the urban population represents only 11% of the total, the people there consume more than ¼ of the total production and over 40% of the available market supply. The urban demand is, therefore, of primary importance for marketing. During the last 15 years, the export trade to Ceylon etc., is reduced very much, but the export of eggs to ships which call at the various ports in India is still there.

Marketing.—Birds are not fattened and prepared for the table as canned chickens and there is only trade in live birds in some of the big cities. As fowls are not confined to regular pens and fed regularly, and as they have to roam about in search of food, many eggs are not laid in the proper places and therefore, not collected and are lost or stolen by birds etc. The value of this loss may be put at Rs. 15 lakhs a year. Owing to unsatisfactory nesting arrangements many eggs are soiled and become dirty. This lowers the price and keeping quality.

Collection of egg and distribution.—The collection and transport of eggs from the rural to the urban parts is by no means systematic. The village egg-collector occupies the key position at the producing end. He calls at irregular intervals and collects in fragile baskets without any packing and the loss in transit through breakages amounts to Rs. 15 lakhs a year. Many eggs are assembled at the ordinary weekly and bimonthly markets. Therefore, many of the eggs would be old before they reach the consumer. The eggs pass through different hands and result in delay which causes serious deterioration in quality. 10%

are definitely stale and 30% are not fresh. These losses materially lower the price and they may be put at Rs. 25 lakhs a year.

There is a notable absence of wholesale poultry and egg markets in the large consuming countries. Usually the platform of the Railway Station is used by the wholesale distributing merchants. They meet the trains on arrival and sell the baskets of poultry and eggs in the condition in which they arrive direct to some buyers on the spot. Other baskets are sent to to the large consumers such as hotels and the remainder are taken by the wholesaler to his premises where eggs may be mixed, sorted or candled before despatch to retail shops which they own.

Grading and Standardization:—The value of the egg depends on its exterior and interior qualities. An examination of a large number of eggs in the wholesale market shows about two-thirds fresh, 30% as 'Cooking quality' and 6% as definitely stale. Only a flat rate is paid to the producers and dealers for all the eggs large and small, but in some of the larger towns wholesale distributors occasionally sort out the eggs according to size and sell larger eggs at a higher price than the smaller. By grading and sorting the eggs before despatch to the consuming centres, 20% of increase in price can be obtained. Apart from this enhanced price return, there is a saving in freight and space by retaining in the producing area itself those eggs which are damaged and not fresh. Steps were taken to prescribe AGMARK grade designations and definitions of quality for hen and duck eggs produced in this country.

Storage and Preservation:—In countries where the trade in eggs and egg products is highly commercialised, cold storage over a prolonged period is commonly practiced. Long period storage is not practised in India. Unsold baskets of eggs may be temporarily stored for a few consuming centres. At present about 40% of the supplies are temporarily placed during the hot weather in cold store day to day. Temporary storage by various indigenous methods as packing husk and placing them in a dark room is also practiced by producers. These indigenous methods are liable to import objectionable odours to the eggs and sometimes stain them also. Hawkers at Railway Stations in the North seem to do quite a good business in retailing hard-boiled eggs to travellers. The preservation of eggs is commonly practised in the case of those exported to Burma which are pickled in lime or with salt mixed with clay and packed in earthern jars. The use of chemical preservatives in India has not so far been practised.

Co-operative Marketing.—Although India has over a lakh of co-operative Societies of various kinds, only a very few are concerned with the marketing of eggs. The average number of eggs handled daily by all the societies is small.

Hatcheries.—The trade in hatching eggs is comparatively small and is confined to the sale of eggs chiefly from Government farms and a few Mission

Farms keeping improved poultry. Only about 3000 dozens are sold annually during the hatching season. There is practically no trade in old chicks and ducklings in India.

Education.—There are no separate schools to impart instructions on poultry farming, but most of the Government Farms and Missionary Farms give practical training in poultry farming. There is a 6 months' course at the Lucknow Poultry Farm. A four months' advanced Post-graduate training to Agricultural and Veterinary Graduates is given at the I.V.R.I., Mukteswar and Izatnagar, both in Poultry diseases and Poultry Husbandry.

Research.—Experiments are being conducted in the various Government Farms on the improvement of this important industry.

Conclusion

Apart from the devastating effects of the present war, this war has compelled us to speed up production of more food and during the past one or two years, the general public has taken up to incorporate poultry farming with the general grow-more-food campaign. The various Army Units have also taken up this industry.

India has got a very bright prospect of sharing a major portion of the world trade in poultry products, as the stocks of poultry in the Western countries were reduced very much due to the concentration in the production of war materials, due to very little amount of importation of poultry food and due to the effects of actual war-fare. China, which used to supply large quantities of egg-products has been disorganised through its continuous war with Japan. There are also other factors which are very favourable for the expansion of the poultry industry:—(1) By the experience gained with the improved breeds of poultry in India during the past two decades, it has been found that all the improved breeds could thrive and adapt themselves to any part of the country and stand up well to the Indian climate. In the warm and genial climate of India, elaborate poultry houses and other equipments are not necessary and the birds do not require such heat producing foods as are given in Western countries. (2) There are plenty of raw food materials available at a cheaper cost. (3) Cheap labour. (4) Availability of waste land which is otherwise unfit for any sort of cultivation from an agricultural point of view. Such waste lands will make ideal runs for fowls. This poor waste land in one or two years, after having been impregnated with rich poultry manure, will become extraordinarily fertile for gardening. (5) Standardized poultry products can be exported, such as frozen or dried eggs. The shipping space, especially refrigeration space is liable to increase when conditions improve and when international trade regains. Large sea ports such as Madras, Bombay, Calcutta and Cochin which are favourably situated in the egg producing areas could easily secure large numbers of eggs. As egg-size does not at all matter in the frozen-egg trade, there appears very good reasons for India to build up a sound export trade when the poultry industry is expanded very rapidly. The demand for dried eggs is becoming more popular in the confectionary and catering trade. The demand is likely to increase further, for the dried products of eggs require comparatively less space in transport and retain all their properties over long periods without refregerations. The canning of chickens appears to have very distinct possibilities, because the different processes of canning are not highly techinical and the necessary equipments and machinery are not very expensive. This branch can be established as a cottage industry, as the normal rates prevailing for chickens and the prices of these products when canned suggest that the production of canned chicken could be made profitable. Many epidemics of poultry can be prevented by better methods of management.

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POULTRY KEEPING IN INDIA

By

Nurul Islam,

Poultry Expert, Delhi Province

In this article, we do not propose to make a chronological study of the subject but would endeavour to confine ourselves to the existing conditions of Poultry Keeping in India with a few suggestions towards its betterment. It may be pointed out at the outset that India is the home of the jungle fowl which is the chief ancestor of all modern breeds of poultry. Poultry breeding in India is traceable from times immemorial. Since precise records are not available, the time when the chicken was first domesticated in India cannot be established with accurate date, yet, as Jull in his 'Poultry Husbandry' points out, the keeping of poultry in India can be said to date as far back as 3,200 B.C.

What really pains one is the fact that, in spite of all the natural, physical and commercial advantages which India possesses, the country still lies far behind in poultry farming in comparison to other countries of the world where this industry stands on equal level with other well-developed modern industries.

Further, the United Nations Conference on Food and Agriculture has recommended that, to avoid malnutrition, it is necessary to increase the production of protective foods of which eggs are the most important ones. It

is an established fact that eggs are wholesome food. Besides, war has changed the outlook of people and has converted many vegetarians into regular egg consumers.

Out of many factors which are responsible for this backward state of industry, the following two are the main ones :—

General aversion of the average middle class person towards keeping poultry, mainly on the ground that, according to his lights, the fowls are so unclean and insignificant a being that he takes their breeding and keeping as degrading and far below his dignity. Secondly, the majority are under the impression that eating of eggs means destruction of life which is wounding to their religious feelings. They are ignorant of the fact that infertile eggs are altogether devoid of any life and hence the question of killing the life does not arise at all. Consequently the correct apprach to the question would lie in wide publicity and sound propaganda to educate the public on the advantages of Poultry Farming, side by side with providing opportunities and facilties for production and marketing of eggs. Though poultry farming can thrive equally well with other industries throughout the length and breadth of the country no attention was paid towards its development before 1910, when Sir H. Butler, the then Governor of United Provinces, and few enthusiastic poultry fanciers laid down the foundation stone of the poultry industry in the form of an All-India Poultry Club at Lucknow which really served like a shining beacon for all the poultry farmers. Since then the interest taken by the Government of United Provinces was abiding and in the year 1919 the first Government institution for the organisation of the poultry industry was opened. This pioneer institution gave a lead to similar schemes in other places. First Punjab, and then Bombay, followed suit soon after. But a really earnest effort to start an organisation for the development of poultry industry began only in 1939-40 with the establishment of a Poultry Research Section at the Imperial Veterinary Research Institute, Izatnagar. The Government of India obtained the services of a highly qualified poultry expert, Mr. A. J. Macdonald, B. Sc., (Agr.) N.D.A., who, before his arrival in India, was serving as Deputy Director, National Institute of Poultry Husbandry, Shropshire, England.

With the wide possibilities for the development of a poultry industry in India, all these efforts have only been mere drops in the ocean and, though improvement is noticeable, it is only negligible. It is therefore gratifying to learn that recently the Government of India have decided that the question of poultry development should be dealt with by an Indian Central Poultry Committee which, as it is proposed, would run on the lines of the Indian Central Cotton Committee.

The author's survey of almost all the capital towns and rural areas of the United Provinces and Delhi province, has convinced him that the absence of a properly trained personnel to advise him on poultry is the main handicap of the

modern Indian poultry farmer. Hence the author puts forward the following suggestions :—

1. Setting up a well-equipped training centre for poultry husbandry to produce the necessary trained personnel for poultry development work in India. In this connection, it is essential to point out that efforts should be made to select persons who have a natural aptitude towards poultry keeping and possess real interest.

2. Initiating propaganda and publicity on a carefully co-ordinated basis. The poultry keepers, particularly those in the villages should be convincingly told that better class poultry kept on scientific lines is more paying than non-descript birds maintained in a casual manner.

3. Organising research on the comparative economics of egg production on scientific and unscientific lines. In these centres of research, the management, housing and feeding of poultry to suit the conditions in the villages and cities should be carefully studied.

4. Opening up of a number of Demonstration Units in different parts of the country to show that the poultry product when marketed scientifically always fetches a higher price.

No work has hitherto been done on the lines suggested above and consequently the poultry industry is not at present successful in many places. There is a much disputed question whether large scale commercial poultry farming would be profitable in this country or not. Unfortunately, evidence available so far, although not based on properly collected data, shows that the number of successful commercial poultry farmers in India is almost negligible. But it must be pointed out that this high percentage of failure does not mean that the fault lies with the system itself. A complete absence of trained personnel is the main reason for such failures. In fact poultry farms are started with little experience of poultry keeping and large sums of money are invested blindly. Naturally such undetakings result in failure.

It would therefore be advisable to sound a note of warning to all the prospective poultry farmers to be very careful in planning the expansion of egg production, not only because of the absence of fundamental research, the need for which has been stressed above, but also because at this stage of uncertain economical factors, it is not possible to forecast prices a year or two hence. This does not imply any discouragement but, as I have already pointed out in the beginning, poultry farming in India has more opportunities of development in the near future than any other branch of livestock industry and I am sure if proper steps are taken to develop this industry, India would soon become a great exporting centre for eggs and other canned poultry products.

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RANIKHET DISEASE IN THE ASSAM PROVINCE

By

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Introduction.—Assam is a land-locked province; the climate is humid and the rainfall high. It consists of hills and dales abounding in forests and marshy lands. There are two valleys, the Assam valley and the Surma valley. It is inhabited by the Hindus and Mohammedans in the plain districts and by the hill tribes in the hill districts. Fowls are reared mostly by the Mohammedans and the hill tribes.

Previous record of the disease in the province.—Previous to my investigation in this Province, cases have been recorded, but the disease did not seem to have received the attention it deserved. After the investigation work taken up by me in 1942, I visited almost every part of the province, especially those districts where fowls are reared in a fairly large number and found this disease—Ranikhet disease—prevalent every where. It is the commonest of fowl diseases and causes enormous loss to the poultry owners. In fact it is the greatest of all fowl scourges in the province. Although the poultry owners undergo a tremendous loss annually, yet they fail to gain by experience what course should be adopted in an actual outbreak. Of all poultry, fowls are perhaps the most travelled birds, and as such Ranikhet disease also spreads from place to place. Up to date the disease has been confirmed by animal inoculation test and post-mortem findings in Kamrup, Khassia and Jaintia Hills, Nowgong and Sibsagar Districts.

Seasonal and topographical influence.—The disease occurs in all parts of the province, breaks out any part of the year but it is found generally at the beginning of the hot season about the month of March and goes on up to October, subsiding during cold weather.

Birds susceptible.—Fowls of all breeds are susceptible to natural infection, but ducks and geese seem to appear to be resistant. In several outbreaks, I observed that although these birds are having a common pen, feeding, watering together with the ailing birds, they have failed to contract the infection. Original workers observed the disease in crows and sparrows, but from observations in the field it is uncommon to find crows or sparrows dying in the affected areas, although the carcase of the dead birds thrown away by the illiterate owners is consumed by these birds.

Mode of infection.—In all probability infection takes place through food and water contaminated with the discharges from the beak and nostrils and also the excreta of the affected birds; also through newly

purchased ailing birds being allowed to mix with the old flock and through the hands and clothes of the attendants.

Incubation period.—The incubation period in a natural outbreak, is hardly possible to asceratain, but it would appear that 3 to 7 days would require for the bird to manifest symptoms of sickness.

Symptoms.—The most characteristic symptom is respiratory distress, characterised by a peculiar long drawn noisy inhalation through the half opened beak, drooping of the wings and paralysis of the legs, followed by death from the fifth to the tenth day. Febrile symptoms are rarely observed in field conditions, but birds with subnormal temperature are very often met with in the majority of cases. Cyanosis of the comb and wattle and foetid diarrhoea of a whittsh or yellowish colour are also generally seen.

Mortallity.—In natural outbreaks the mortality generally runs up as high as 90 per cent. The recovered birds were found to be immune to further infection.

Immunity test.—The author, after long and strenuous search throughout the Province has been able to obtain a few recovered birds. They were tested with 1 c.c. of live virus received from Mukteswar. The result was that the control birds and the contact fowls developed the disease showing clinically all the symptoms suggestive of Ranikhet disease on the 4th and 5th day and all of them died on the 7th to 10th day. Post-mortem lesions were typical of Ranikhet disease. The recovered fowls were not affected at all, and remained healthy and well.

Post-mortem examination.—Over 50 post-mortem examinations were performed and there appear to be no characteristic lesions; in peracute cases the lesions are negative. But in birds that have suffered for several days, haemorrhages of various sizes are seen in the glands and follicles of the mucous membrane of the Proventriculus, with gastro-enteritis throughout the intestines and rectum ; in some bad cases ulceration with necrotic foci are seen. The lungs generally show no changes, although acute respiratory troubles were observed during life time.

Treatment.—Treatment with various drugs were tried under field conditions but none has been found of any value except Novarsenobillon (N.A.B.) of Messrs. May & Baker, Ltd., which was tried on three occasions with very encouraging results. This experimental treatment was carried out under strict segregation as follows:—

(1) Two R.I.R. cocks and hens suffering from Ranikhet disease were each given intravenously ½ grain of N.A.B. dissolved in I c.c. of distilled water. Both the birds recovered.

(2) Of four fowls found to be suffering from the disease, two were put under treatment, and the remaining two were left untreated. The birds under treatment recovered, while those left untreated died. Materials from the latter were collected and inoculated into the immune birds, two control fowls and pigeons. One fowl was kept as a contact bird. All the control and the contact birds developed the disease and died, but the immune fowls were not affected at all.

The drug has been found to give encouraging results and further trial will be given in future.

Control measures.—As preventive inoculation measures are not yet available for use at present and as treatment is considered to be of no value, hygienic measures are the only available control measures in the combating of this disease. This should include the destruction of the houses, pens and runs and also utensils used for feeding and watering. If these are applied properly the disease can be brought under control with a few losses only. But under field conditions application of these measures are fraught with difficulties and therefore we have to rest for the present with preaching of these measures.

THE EFFICACY OF NEMURAL IN CESTODE INFESTATION OF FOWLS

By

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A flock of Rhode Island Reds numbering 13 were found infested with Cestodes. Three of the heavily infested adult birds were given half tablet (one-eighth grain) of Nemural at 8 a.m., on their empty crops. They were then kept under observation for two hours when clusters of Cestodes were passed with faeces. One of the three treated birds was found off colour, sleepy and passing bloody mucus on the following morning. The faeces were found negative on microscopical examination. The bird expired on the third day. Autopsy showed haemorrhagic patches in the intestinal mucous membrane with formation of parasitic nodules, varying in sizes from a pin head to a mustard seed. Some cestodes were also found in the lumen of the intestine. The other two treated fowls were found quite lively. No ova of parasites could be revealed on microscopical examination of the faeces of these two fowls.

Unfortunately, at this stage, the flock contracted Ranikhet disease by the introduction of a diseased fowl and further trial with Nemural could not be carried out.

Specimens of Cestodes were identified as '*Rallietina Tetragona*'.

SELECTION AND CARE OF HATCHING EGGS

(AN ARTICLE FOR POULTRY-KEEPERS.)

By

M. MAQSOOD

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Practical experience in poultry-keeping has taught that no matter how perfect and careful the management of the broody-hen or incubator, maximum results depend on hatching eggs of high quality. Eggs weakened or soiled through improper handling or of poor fertility cannot be expected to produce large numbers of strong, livable chicks. Quality is the basis for success and in poultry industry it necessitates not only the production of good sized chicks of high livability, but of chicks with the inherited ability to lay a large number of eggs of good size, shape, colour and texture. Consequently to have birds that will lay a large percentage of fertile eggs, of the requisite standard, care is necessary in the selection of eggs that are to produce such individuals.

BASIS FOR EGG SELECTION

High quality fertile eggs properly incubated will always produce high quality chicks. One of the most important essentials is that the stock which lay eggs must be in a perfect condition of health and possess a high degree of vitality. In a fowl run, for every 10 laying hens, one cock of good stamina and of high sexual vigour is necessary, apart from their well balanced daily ration. They must be freely fed on separated milk (*lasi*) as it is especially rich in certain factors which are responsible for good hatchability. It is practically impossible for a hen of weak constitution or otherwise diseased to lay an egg satisfactory for hatching. The very fact that the eggs are malformed or mis-shaped usually indicate some weakness in the breeding stock. While selecting eggs for hatching purposes, the following points must be taken into consideration :—

1. External condition.
   - (*a*) Shape
   - (*b*) Size
   - (*c*) Colour
   - (*d*) Soundness of shell
   - (*e*) Cleanliness of the egg
2. Internal condition.
3. Age of the Egg.

EXTERNAL CONDITION

Shape :—Eggs should be of a good regular, oval shape. Mis-shaped eggs especially those which are too pointed, fully circular, ridged, having thickened rings around the shorter axis or otherwise unsymmetrical should be rejected as they rarely hatch even under good hatching conditions.

Size.—Eggs for hatching should be neither too large nor too small but they should be of average size—a standard fixed for each breed. Broadly speaking eggs weighing between 1¾ to 2¼ ozs. give quite good results.

Colour :—The eggs should have a reasonably uniform colour which is specific of the breed. Tinted shells in white eggs and wide variation in colour in brown eggs should be avoided. Eggs which have been stored for a long time, usually become some what changed in colour.

Soundness of the shell :—Cracked eggs and eggs with thin, rough, porous ridged, thin-butts, thin tips shells do not usually hatch. Shell thickness is important both from the standpoint of resistance to breakage and the hatchability of eggs. Eggs which are coated with some preservative or some greasy material should be avoided as the natural pores of the shell are closed.

Cleanliness:—Eggs for hatching should be kept clean for the following reasons :—

(*i*) That infection may not take place by the entrance of certain micro-organisms through the shell pores and thereby set up certain putrefactive and degenerative changes. The contents of a normal new laid egg as a rule contain no bacteria.

(*ii*) That the shell pores may not be blocked and respiration of the developing chick interfered with.

If it is necessary to hatch dirty eggs, it is usually best to clean without wetting as washed eggs usually deteriorate very rapidly because the protective covering on the shells are destroyed. If it is not possible to clean eggs otherwise, then they may be carefully rubbed with a moist cloth, only on the day when they are to be placed in the incubator.

INTERNAL CONDITION

Just as the eggs should be perfect externally they should be perfect internally also because any defect will greatly interfere with hatchability. Candling is the best method available for determining the condition of eggs without breaking them and in this way eggs with interior defects such as blood clots, meat spots, bloody albumin, eccentrally placed yolk, double yolks, air bubbles, ruptured air cells, etc., which are not readily detected on superficial examination, are removed.

AGE OF THE EGG

It is essential that freshly laid eggs should be used for hatching because the sooner they can be placed in the incubator the better will be the hatching result. The reason being that while the egg is in the oviduct of the hen, embryonic development begins and if the incubation is delayed, the hatchability of the eggs decreases rapidly after about 10 days. In countries like India, eggs which are more than 5 or 6 days old in hot weather and more than 10 days old in winter, should not on the safe side be used for hatching.

CARE OF HATCHING EGGS

Eggs for hatching should be gathered at least twice daily so as to prevent extreme chilling in severe cold weather and heating in hot weather. Egg when laid has usually the temperature of the hen's body, therefore gradual cooling is essential. They should be handled as little as possible to prevent soiling and to preserve the natural bloom or waxy surface on the egg. It is very essential that oil or grease be kept away from the surface of the eggs because a very little amount of grease will usually prevent hatching. While placing eggs, it must be borne in mind that they should on no account be stored with the small end up as the degree of hatchability of the egg, deteriorates more rapidly in this position. They must always be stored on their sides or with the large ends up and if possible they should be turned at least once daily. This keeps the yolk in its proper place and avoids any possible adhesions to the shell.

Eggs should be stored in a clean, moderately moist and well-ventilated room and covered with a clean dry cloth in hot season so as to reduce the risk of evaporation of the natural moisture. An ideal temperature for storing eggs is about 50 to 60° F. as this temperature prevents further growth of the embryo—a low temperature will injure the germ and a high temperature will start the growth of embryo. In summer months, the storage chamber should be kept moist by sprinkling water on the floor but a cellar is an ideal egg storage room.

POULTRY INDUSTRY IN MADRAS

By

H. Narahari Rao,

Poultry Development Officer, Madras.

Introduction:—When man lived in a primitive stage and was a savage all animals and birds were also wild. The first step in advance came when he began to realise the value of birds, to bring animals under control man took a keen interest for its colour, which later developed to the sport of cock-fighting. The recorded evidence that fowls were domesticated, so early as

3,000 B. C. clearly shows, that poultry in general is closely associated with man-kind from time immemorial. The numerous existing breeds and varieties of domestic fowls with plumage colouration and structural features have been developed by breeding methods practised by man throughout the ages.

The naturalists, who made a close study of the origin of fowls agree that the present day domestic fowls have originated from the jungle fowl "*Gallus bankiva*"—red jungle fowl—their original home being, India, Malaya, Ceylon and Burma. From a limited beginning, the original fowls of the bamboo forests of India have been developed so well that their poultry meat and eggs occupy today a very important place in the Nation's food supply. Among the animal products used for human consumption there are few other commodities so largely used as Poultry meat and eggs.

In general, poultry includes all classes of domesticated birds that are of economic value to man. They are chickens, ducks, geese, guinea-fowls, pigeons, turkeys, pea-fowls etc.

Although India is the original home of the jungle fowl from which the modern breeds have been evolved, this country has not made any appreciable progress in the improvement of the industry as compared with the European Countries. In general fowls are kept under primitive conditions of housing, feeding, and managment. No attempt is made to improve the stock by selective breeding and most of them are of very poor standard for meat and egg production. For want of organised efficient marketing, the poultry product considerably deteriorates by the time it reaches the consumer. The scattered production, the distance involved in the transport of eggs, bad communication, lack of knowledge in marketing are responsible for the present backward state of the industry.

The fowl population is excessively low in proportion to the human population, the average production is low per bird, losses from diseases are high, consequently the average annual consumption of eggs and poultry per head of population is very small. Compared with Denmark (prewar figure) which keeps 300 laying fowls per 100 head of population, India has only 15. The average annual production in India, per bird is only 50 of 1½ ounce eggs while the corresponding figure for Denmark is 120 of 2 oz. eggs. The per-capita consumption in Madras is 10 eggs per annum as compared with 7·8 for the all India figure. Canada consumes 260 eggs per head, England 158, Ireland 283 and the United States of America 236. So, a person in Canada or Ireland eats 2 eggs in 3 days, whereas an individual in Madras does not consume even one egg a month.

During recent years, more attention is paid to poultry keeping as many have come to realise the benefits of the industry, due to the growing demand for larger and better eggs and better class of fowls for table.

It should be mentioned here that much pioneer work has been done by the various missionary institutions in introducing the improved fowls in some of the selected villages but the results achieved are perhaps far too limited taking the population and the vast area involved into consideration.

The improvement of poultry can be achieved by the following methods.

(*i*) Simple selection, among the Desi fowls.

(*ii*) Crossing the indigenous fowls with purebred males as to reach a purebred type.

(*iii*) Improving the existing pure types and multiplying them in large numbers and thus replacing the existing mongrel birds.

Simple Selection:—This is the simplest way of mating the best to the best. The method is based on the experience that the offspring of a good individual is better than that of a bad one and that the offspring of any animal, show variations with the chance of some of them varying in the desired direction in the Mendallian methods of improving a breed. A thorough understanding of the factors or a combination of factors which represent each character of individual is necessary. In a highly improved breed, the above method may not bring forth any tangible or beneficial results. To overcome this difficulty, we have to follow what is called "Pedigree selection". In this method every attempt is made to get hold of good characters not only in the individual but also in those which have been in the past 'hereditary' in the individual. The idea is that if the characters have been transmitted through generations in the past with a degree of regularity, it will tend to be hereditary in the future also.

As regards the introduction of the pure breeds, much has been achieved in the past several years. Government Poultry institutions and the Agricultural farms are maintaining pure breeds of fowls like White Leghorns, Rhode Island Reds, Black Minorcas for the production of hatching eggs and breeding chickens, for distribution to the districts. As a further step to improve the stock, 18 poultry demonstration units are functioning in the various veterinary institutions all over the presidency and six more have been added in the past official year. Private institution like the one at Katpadi is doing some useful work in poultry breeding in the North Arcot District, for which the Mission is receiving a subsidy from Government. The Mission agrees to sell each year 200 purebred cocks for breeding at concessional rates to the villagers, Hatching eggs are also sold to the cottagers at a concessional rate of 1 anna each.

A Central Poultry Research Station has started to function at Madras where select breeding of indigenous fowls has been in progress for some years. The results achieved have been satisfactory that the average

production for the indigenous hens has been more than 110 eggs per year with a corresponding increase in size also. In addition pure breeds of White Leghorns, Rode Island Reds and Black Minorcas are maintained for distribution of setting eggs and breeding chickens to the public. The demand has very greatly increased and it should be admitted that we are not able to cope with.

A large poultry farm is also attached to the Livestock Research Station, Hosur, where the exotic breeds of fowls are maintained for distribution of breeding chickens and setting eggs to the districts.

We are hoping to augment the present supply by slowly opening many more farms and poultry units in the future.

PEDIGREEING IN POULTRY

BY

D. A. RAMANATHAN, G.M.V.C.,

Poultry Officer, Livestock Research Station, Hosur Cattle Farm.

Maintaining the pedigree of individual animals in a livestock breeding Farm is a very important item of work. The same applies equally to a Poultry Farm. It is rather easy to note the sire and dam of a progeny belonging to the mammalian species. But it is not so with regard to poultry, for, eggs belonging to more than two or three hens are set for hatching under a broody hen; much more so when eggs from many hens are set in an incubator. All the chicks get mixed up when hatched, and, are, therefore, difficult to identify them individually, in other words, it will be impossible to know their pedigree. The following is the method of pedigreeing adopted in this Farm.

1. *Pedigreeing under Broody hen*:—When two or three breeds of fowls are kept in a Farm three or four fresh eggs of good quality in each breed laid by a single hen on successive days are selected. (It is needless to say that the hens are very high producers of good quality eggs and the sires are also from good strains). About a dozen eggs, four from each hen of three breeds are set under the broody hen. The parentage of the eggs, *i. e.*, the dam and the sire are noted. After hatching, the chicks are wing-banded and toe-punched. The chicks in each breed will be brothers and sisters when they are sexed the pedigree of them are noted in their pedigree charts.

2. *Pedigreeing incubator*:—When a large number of eggs are set in an incubator, the particular eggs from which chicks to be pedigreed are marked, after the removal of infertile eggs by candling on the sixth or

seventh day. Again on the 14th day the eggs are candled to remove dead germs. On the 18th day the eggs from which pedigreed chicks are to be hatched out are placed in special cages known as pedigree cages. Two types of pedigree cages are used here. (1) Single egg cages made of wire frame with mosquito-net covering all round and (2) All metal wire netting cages (small mesh) in which 3 or 4 eggs can be kept. The dimensions of the former are 3" x 3" x 3" and of the latter are 6" x 6" x 3". While placing the eggs in the cages the particulars of the eggs are noted in a slip of paper and placed along with the eggs. The chicks which hatch out from these eggs kept in the pedigree cages will be trapped and cannot mix up with the other chicks that came out from the eggs in the egg tray. When the hatch is over, the pedigree cages are taken out and the chicks removed from them, wing-banded and toe-punched, and the sire and dam of each chick are noted against their individual number. When they are sexed the individual pedigree is noted in the pedigree charts.

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Association News

THE ALL-INDIA VETERINARY ASSOCIATION
(Madras Branch).

PANIKKAR MEMORIAL FUND.

List of subscription from 18-4-45 to 5-9-45.

(Continued from page 362, May 1945).

		Rs.	A.	P.
	Brought forward ...	1,055	2	0
1.	Lt. K. P. Damodaran Nair	10	0	0
2.	K. M. Yakubshah	5	0	0
	Total Rs. ...	1,070	2	0

Note :—A sum of Rs. 1000/- has been credited to Government account as the nucleus of the Fund. Further contributions to the above Fund will be added on to the corpus as occassion arises. The Fund is still kept open.

Madras,
12—9—1945.

V. GURUMURTI,
Jt. Secretary and Treasurer.

COORG VETERINARY ASSOCIATION

Proceedings of the 2nd Annual General body meeting held at Mercara under the presidentship of Dr. C. B. Somanna on 4th may 1945.

The following resolutions were passed unanimously.

1. This Association reaffirms all the resolutions passed at the previous extraordinary general body meeting held on the 5th of July 1944. As no replies to them have so far been received, it requests the Chief Commissioner to consider these resolutions favourably at an early date.

2. This Association recommends to the Chief Commissioner to give all the facilities to the Model Dairy Farm (which has been fortunately opened recently, by deputing a Veterinary Assistant Surgeon to undergo I. D. D. training to be in charge of the farm.

3. This Association recommends to the Chief Commissioner to be pleased to allot the next All India scholarship to one of the Veterinary Assistant Surgeons in Coorg to undergo training in foreign countries.

4. This Association recommends to the Civil Veterinary Department to move the Government to supply all the veterinary dispensaries with necessary reference books.

In view of the fact that several of an individual and collective representations for the betterment of the members individually as well as the Department, having not been so far sympathetically considered, it is prayed that the Chief Commissioner may be graciously pleased to accord an early interview to a representative body of this Association consisting of the President, Vice-President and the Secretary.

With a vote of thanks by the Secretary, the meeting terminated.

Ponampet }
30-7-45 }

A. M. MUTHAPA,
Hony. Secretary.

College News

BENGAL VETERINARY COLLEGE

The following students have passed the Supplementary Diploma Examination of the Bengal Veterinary College for the Session 1944—45 held on and from the 16th to 18th July 1945.

Serial No.	Name			Place of origin
1.	Md. N. Rahman	...	...	Bengal
2.	B. B. Singh	...	...	U. P.
3.	K. Biswas	...	...	Bengal
4.	Md. S. H. Khan	...	...	,,
5.	S. K. Sen Chowdhury	...	...	,,
6.	A. Hassan	...	...	,,
7.	S. N. Mundu	...	...	,,
8.	B. J. Banerjee	...	...	,,
9.	S. K. Ghosh	...	...	,,
10.	N. Mukherjee	...	...	,,
11.	A. M. S. Rahman	...	...	,,
12.	B. K. Banerjee	...	...	,,
13.	N. B. Ray	...	...	,,
14.	R. N. Sen Gupta	...	...	,,
15.	B. B. Roy	...	...	,,
16.	K. C. Mukherjee	...	...	,,
17.	K. A. T. M. Siddique	...	...	,,

Belgachia }
23-7-45 }

A. LATIFF, B.H.V.S.,
Principal.

MADRAS VETERINARY COLLEGE

Admission of students

The number of applications received this year was 156 and the number selected was 85. The number of students joined actually to the Diploma and Degree courses for the current academic year was 54 from Presidency and 9 from outside.

Madras,
21—9—45.

R. SWAMINATHAN, B.A., G.M.V.C.,
Principal.

Correspondence

The views expressed in letters addressed to the Editor represent the personal views of the writer and must not be taken as expressing the opinion or having received the approval of the A.I.V.A.

"Poultry Farming and Veterinary Science"

Sir,

The Veterinary education is being imparted to the students in India for the last 70 years or so but so for as I learn, I think in no institution the subject of Poultry farming is included in the syllabus of the teaching of Veterinary Science which is urgently needed for the improvement of the science and the status of Veterinary Surgeons of the modern days.

If Poultry farming is added in the course of study a Demonstrator or Professor specialised in the subject should be appointed for the theoretical and practical teaching at all the Veterinary Colleges of India. For practical training a Poultry farm should be maintained at the Veterinary College, which can give Practical idea of (1) Housing, (2) Poultry Hygiene, (3) Grading of Poultry, (4) Preserving eggs, (5) To distinguish fresh and rotten eggs, (6) Table eggs, (7) Artificial incubation, (8) Natural Hatching, (9) Management and feeding of chicks, (10) Management and feeding of adult stock, (11) Caponising, (12) Fattening fowls, etc.

The Poultry farm should consist of one breed such as Rhode-Island-Red, or White-leghorn, or Black-Minorca, or any other breed selected by the authorities concerned because the selection of breed depends much upon the nature of the soil and the climatic conditions of the place. *e.g.* in damp districts Rhode-Island-Red, or Buff-orpington, or Light Sussex thrive well.

These Poultry farms of Colleges can be the centres of distribution of pure bred males at reasonable rates to other Poultry farms of Private concern or their own branches if opened somewhere or to the farmers of the country for the development of home industry, which would be a stepping stone for the improvement of the size of eggs and fowls and also for the improvement of laying power of birds.

Poultry farms at the colleges should be of Modern equipments, *e.g.* Incubators, testing lamp for eggs etc., and should run on economic basis as far as possible. It can sell surplus of eggs, hens, cockerels, etc., to general public or to any poultry dealer.

Students should also be taught in detail about the diseases of Poultry. Disease is the cause of the majority of failures in the industry of Poultry farming, once disease gets hold of a flock it is very difficult to eradicate and perhaps may take years.

Yours faithfully
B. R. PHANSE, G.B.V.C.,
Veterinary Surgeon and Stable Superintendent.

Dharampur State
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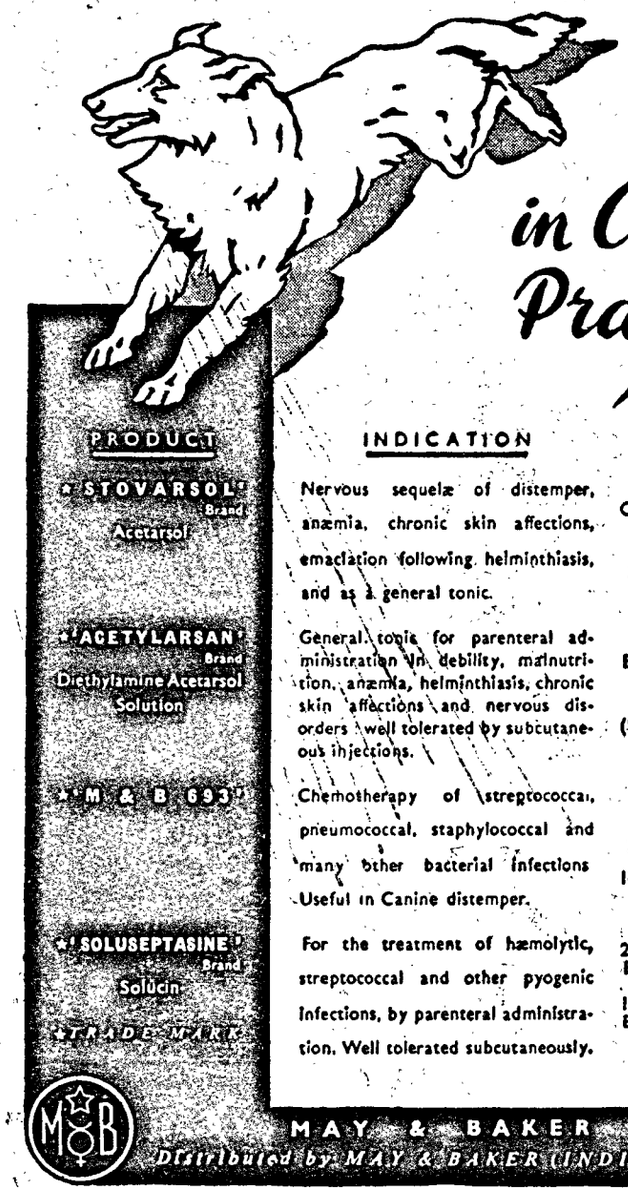

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