DOMINION OF CANADA
DEPARTMENT OF AGRICULTURE
DOMINION EXPERIMENTAL FARMS

POULTRY DIVISION

REPORT OF THE DOMINION POULTRY HUSBANDMAN

F. C. ELFORD

FOR THE YEAR 1930

New Canadian Egg Laying Contest house, Central Experimental Farm, Ottawa.

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POULTRY DIVISION

REPORT OF THE DOMINION POULTRY HUSBANDMAN, F. C. ELFORD

GENERAL CONDITIONS

The poultry industry experienced a successful year during 1930. Hatching results were excellent during the spring and a larger percentage of chicks was brooded than in previous years. Improvement along this line would appear to be general throughout the industry from year to year, due mainly, no doubt, to greater efficiency in the selection of the breeding flock and particularly to improved feeding methods in so far as the breeding stock is concerned.

In many sections of Canada a rather backward spring and summer increased difficulties in brooding with the result that very little increase in the percentage of stock raised to maturity was noticeable, in the aggregate for the year. The young stock grew well, however, and the quality of pullets put into the laying houses was quite up to standard.

Egg production kept up well during the spring and summer, and owing to unusually mild weather during the fall and early winter, continued so over into the new year. As a result egg prices were not maintained during the usual season of high prices and an unusually heavy flow of eggs from the Prairie Provinces and British Columbia caused prices to break sharply well in advance of the usual time.

Fortunately for the producer, owing to the glutting of world grain markets feed prices were exceptionally low. At the same time prices for poultry meat were excellent consequently a good many poultrymen sacrificed all but their breeding flocks rather than take the low price for eggs. This in itself has a tendency to diminish the egg surplus and stabilize prices.

THE DIVISION

Divisional activities, during the past year, were varied and for the most part made substantial progress. Concerning fertility, hatchability and viability of chicks it may be said that previous results were surpassed during the hatching season of 1930. Particularly gratifying were the results in livability of chicks, a mortality of only 3·8 per cent up to three weeks of age being experienced at the Central Farm during the year.

Owing to infestation with intestinal parasites mortality in the pullet stock was quite high and as a consequence the customary headway was not made in so far as the breeding work is concerned. Experimental work for egg production also suffered for the same reason, some of the experiments having to be discarded owing to lack of reliability of data due to excessive mortality. This also applied, to a more limited extent, to the breeding work. The egg production experiments commenced in the fall of 1930 give promise of results of value, however.

A satisfactory year was also experienced by the Egg Laying Contests and Registration policy, the Contest production showing an increase over the previous year. Registration of birds is also proceeding satisfactorily.

A long awaited improvement was inaugurated with the commencement of the 1930-31 Contests, namely, the new Canadian Contest house at Ottawa with accommodation for the entire eighty pens of the contest under one roof. Hospital equipment was also provided for the segregation of sick birds.

ACKNOWLEDGMENTS.—The officials of the Division and the particular branch of the activities for which they are responsible are as follows:—

Mr. Robertson, Chief Assistant, has the direction of the division during my absence and is directly in charge of the breeding work and oversight of the

poultry work on the Central Farm. He is responsible for that part of the report dealing with breeding.

Mr. Taylor is in charge of Canadian National Egg Laying Contests and Registration. The compiling of the Canadian National Poultry Record Association's Annual Blue Book, the official publication of the registered poultry breeders of Canada, is under his care.

Mr. Gutteridge has the oversight of experimental work, the direct supervision of the experiments conducted at the Central Farm and assists in the direction of those carried on upon the branch Farms. Also, he has the responsibility of the compiling of this report.

Mr. Roy has charge of the work in the province of Quebec, including assistance to the poultry men upon the branch Farms, co-operation with the provincial Department of Agriculture, registration, inspection and survey work.

Mr. Scott, registration inspector for Ontario for some years, was transferred as head poultryman upon the establishment of a poultry plant and Egg Laying Contest at Harrow. Mr. McConnell, poultry exhibitor at this division for the past five years, succeeded him as registration inspector, his place being filled in turn by Mr. W. A. Garland, who is responsible for that part of this report dealing with Farm, Egg and Poultry Accounts and Demonstrations and Exhibits.

Dr. Weaver is the medium through which this division co-operates with the Health of Animals Branch of the federal Government. He is in charge of the laboratory at this office which is equipped for the investigation of poultry diseases. A large number of autopsies are made annually and methods of prevention and treatment for numerous ailments considered. The Experimental Farm flocks throughout the country have now all been tested for pullorum disease through the agency of this laboratory.

BREEDING

Breeding at the Central Experimental Farm is carried on with Barred Plymouth Rocks and White Leghorns largely, with a view to the gaining of knowledge in the production of high laying strains, but some work is also done in crossing with a view to the production of high quality table poultry. For this latter purpose a top cross of Cornish was used with Plymouth Rocks, Wyandottes, Rhode Island Reds, and Dorkings. The male progeny were caponized and crate finished.

A comparison between the crosses was all in favour of the Cornish x Rock cross, which produced not only the largest birds but also the most uniform in size, appearance and quality.

The cross-breeding work will be continued and other crosses used for comparison with the Cornish x Rock cross.

During the past season there were hatched 9,325 chicks, of which 1,640 were used for chick-feeding experiments, 1,103 were sold as day olds, 919 as broilers, and the balance, after allowing for losses, reared for the replacement of stock, experimental work, and sale of breeding stock to farmers. For this latter purpose there were 407 birds disposed of, 137 males, all of which were from dams that had laid at least 200 eggs in their pullet year, and 270 females of similar lines of breeding. In addition to the above there were also disposed of for the improvement of stock 2,233 hen hatching eggs and a limited number of duck eggs and breeding ducks and geese.

Testing for pullorum disease has been practised at this farm for the past four years and the chick mortality during the past season was the lowest it has ever been on the Central Farm—96·21 per cent of all chicks hatched being raised to wing-banding age, a mortality of 3·79 per cent. Before blood testing was practised the chick mortality used to run around 20 per cent. This indicates what a great saving might be effected if testing for pullorum disease were generally practised throughout Canada.

EXPERIMENTAL WORK

As has already been pointed out, owing to excessive mortality upon the poultry plant, the reliability of the results of feeding tests was very greatly detracted from. As a consequence, although a greater amount of research work was undertaken than ever before, the results of a few were unsatisfactory and will not be published in this report. In addition to this factor there is the case of those experiments which are being carried on for a period of years to publish the results of which, even as a progress report, would be misleading.

The experiments for egg production, as before mentioned, will not be reported in this report owing to excessive mortality in the pullets due mainly to intestinal infestation. One entire group of nutrition experiments with brooding stock was also interfered with by this same trouble, and the results consequently were discarded. Another series of brooding experiments escaped this infestation and is reported herein. The battery brooders were also used in brooding experiments during 1930 and these experiments are also reported here.

For the most part experiments were carried on with a view to obtaining practical results readily of use to the poultryman. To projects of this type have been added those of a more technical nature which, although not apparently of immediate practical use, yet furnish information which enables better understanding of the principles of feeding, breeding, or some other poultry practice.

In the discussion upon experiments which follows it is essential to bear in mind that in most cases the experiments will be carried on until such time as it is felt that definite conclusions can be drawn, which in some instances will be over a period of four or five years. The material here given may constitute only a progress report. When it is considered that conclusions are justified a final report will be made. A considerable amount of experimental work is being done by the branch Farms, results of which may be found in the annual report of the Farm or Station concerned. In some cases brief mention will be made of experiments upon the branch Farms which correspond with experiments carried on at this division.

HATCHING SUMMARY

Satisfactory improvement over the previous year's results was indicated by the hatching summary for 1930. The summary constitutes the results in fertility, hatchability, and viability of chicks over the Experimental Farms System, and as such is a bird's eye view of hatching conditions in Canada since all provinces and varied climates are represented therein. The table following comprises a summary of hatching results upon the Farm System from 1924 to 1930:—

TABLE 1.—HATCHING SUMMARY—EXPERIMENTAL FARMS AVERAGE—SEVEN YEARS

Year	Total eggs set	Number fertile	Per cent fertile	Number of chicks	Per cent total eggs hatched	Per cent fertile eggs hatched	Number of chicks alive when wing banded	Per cent chicks hatched alive when wing banded	Total eggs required for 1 chick hatched	Total fertile eggs for 1 chick hatched	Total eggs required for 1 chick when wing banded
1924.....	63,820	49,528	77·6	21,813	34·1	44·0	14,605	66·9	2·9	2·2	4·3
1925.....	62,725	51,161	81·6	24,357	38·8	47·6	19,431	79·8	2·6	2·1	2·9
1926.....	75,169	60,010	79·8	27,761	36·9	46·3	17,293	83·7	2·7	2·2	3·3
1927.....	63,242	50,183	79·3	24,495	38·7	48 8	20,361	83·1	2·6	2·0	3·1
1928.....	85,066	68,979	81·1	39,303	46·2	56·9	29,970	87·2	2·1	1·4	2·36
1929.....	92,103	76,562	83·1	44,126	47·9	57·6	32,967*	86·5*	2·1	1·7	2·4*
1930.....	98,758	82,560	83·6	49,040	49·66	59·4	44,930	91·62	2·01	1·68	2·2

*Day old chicks sold.

It will be noticed from the above table that a greater number of eggs was set during 1930 than the previous year. Very little change is indicated in fertility over the previous year. A substantial increase in the percentage of total eggs hatched is noted with a corresponding increase in the percentage of fertile eggs hatched.

The most important improvement, however, was in livability of chicks, an increase of 5 per cent more chicks reaching the age of three weeks, which period may be considered as the most crucial during the entire brooding period. There is no doubt that the fact that practically all of the Branch Farms had been tested for pullorum disease previous to 1930 is a factor of importance in the low mortality experienced. Superior care in the selection and handling of the breeding flock would also be a factor of importance in the bringing about of this result. While a mortality of only 8·4 per cent might not be considered exceptionally low in individual cases, when it represents an average over a great many farms it becomes quite satisfactory and represents a substantial increase over the previous year.

With regard to time of hatch, the 1930 summary shows gradual increase in hatchability, from February to May. Livability of chicks was highest for those eggs set in March and April.

In considering hatching results according to breed, fertility was superior for the Rhode Island Reds, with little to choose between the other breeds. Hatchability was also quite superior for the Reds, with the Barred Rocks and Leghorns almost equal and considerably poorer in this regard. The White Wyandottes were intermediary between the last-mentioned breeds and the Reds in this respect. Mortality to three weeks of age was practically equal for all breeds, White Wyandottes only being considerably inferior.

As has always been the case in past summaries, hens gave superior results to pullets throughout. It is altogether likely that body weight and condition, upon which antecedent production has the greatest effect, are chiefly responsible for this condition.

EFFECT OF EGG SIZE ON HATCHABILITY

Work was continued during 1930 in order to determine whether egg size has any effect upon results in hatchability obtained. Eggs from the same birds over the entire hatching season were separated according to the following classification and incubated under identical conditions.

No. 1—Over 24 ounces to the dozen.
No. II—22 to 24 ounces to the dozen inclusive.
No. III—Under 22 ounces to the dozen.

Double-yolk eggs and those distinctly malformed or checked were eliminated as would be done under ordinary conditions of incubation. The following table shows the results for 1930 and an average for the years 1928, 1929, and 1930:—

TABLE 2.—EFFECT OF EGG SIZE ON HATCHABILITY

Class	Eggs set	Number fertile	Number hatched	Per cent fertile	Per cent fertile hatched	Per cent total hatched	Average weight per chick
							oz.
No. 1—1930	1,561	1,205	803	77·19	66·64	51·44	1·38
Average 3 years	3,983	3,172	2,105	79·64	66·36	52·85	.....
No. 2—1930	2,918	1,561	1,016	77·35	65·09	50·35	1·25
Average 3 years	5,248	4,158	2,746	79·23	66·04	52·32	.....
No. 3—1930	1,994	1,433	975	71·87	68·04	48·90	1·08
Average 3 years	4,133	3,117	2,106	75·42	67·56	50·96	.....

From the above table it may be noted that in the experiment to date hatchability has been practically identical for each of the three classes. This is particularly interesting in view of the fact that in the past it has been taught that large eggs would not give as good hatchability as smaller ones. In this experiment all eggs above 24 ounces to the dozen were included, excepting those containing two yolks, consequently many eggs as high as 26, 28, and 30 ounces to the dozen are included in these calculations.

It is apparent from the above figures that under conditions similar to those existing upon this poultry plant, conditions fairly well representative of those on the general commercial poultry plant, similar hatchability may be expected from large and small eggs. It is also important to note that the weight of the chick at time of hatch varies fairly well proportionately to the size of egg from which it comes.

Additional incubation experiments which have been carried on for a period of three or four years each are not reported upon at this time for various reasons.

An experiment dealing with the effect of ultra violet rays upon hatching eggs, now in its fifth year, is not reported owing to the necessity for further work to substantiate results as so far obtained. Another project dealing with hatchability of eggs of good and poor shell is held over for the same reason. Four years' work upon the effect of the addition of moisture in varying amounts during the incubation period upon hatchability is also being held over for a final test which it is hoped to carry on during the incubation season of 1931, in order to finally clear up certain points which at present are not altogether clear. It is hoped to report more fully upon these projects at a later date.

VARIATION IN PERCENTAGE OF ANIMAL FEEDS FOR GROWTH PRODUCTION

In order to determine the response in growth attainable by variation in the percentage of animal feeds four lots of Barred Plymouth Rock chicks were raised in batteries to the age of seventeen weeks upon rations varying greatly in protein analysis. Each lot was composed of day-old chicks, forty-five in number, and from similar parent stock. The mashes fed were made up of equal parts of shorts, middlings, corn meal, oat flour with bone meal, milk powder, fish meal and meat meal. Cod liver oil and salt were also added at the rates of 1 per cent and ½ per cent by weight respectively. The first four ingredients, namely, shorts, middlings, corn meal, and oat flour, remained constant, as did also the proportions of the animal feed ingredients in all four mashes. The total amount of animal feeds was varied, however, to make 5, 10, 12, and 20 per cent of the mash by weight. Scratch grains were also given in similar proportion to each pen throughout the experiment.

Following is the analysis of the different mashes:—

—	Ash	Fibre	Protein	Fat	Carbo-hydrates	N.R.
5 per cent mash	3·92	3·40	13·8	4·9	52·9	1 : 4·6
10 per cent mash	4·82	3·2	15·4	4·9	50·4	1 : 4·0
12 per cent mash	5·8	3·1	15·9	5·1	49·6	1 : 3·8
20 per cent mash	6·8	2·8	19·0	4·2	45·1	1 : 2·9

The graph and table following show the growth curve for each pen up to seventeen weeks of age, total feed consumption for the same period, and complete detailed data for the experiment:

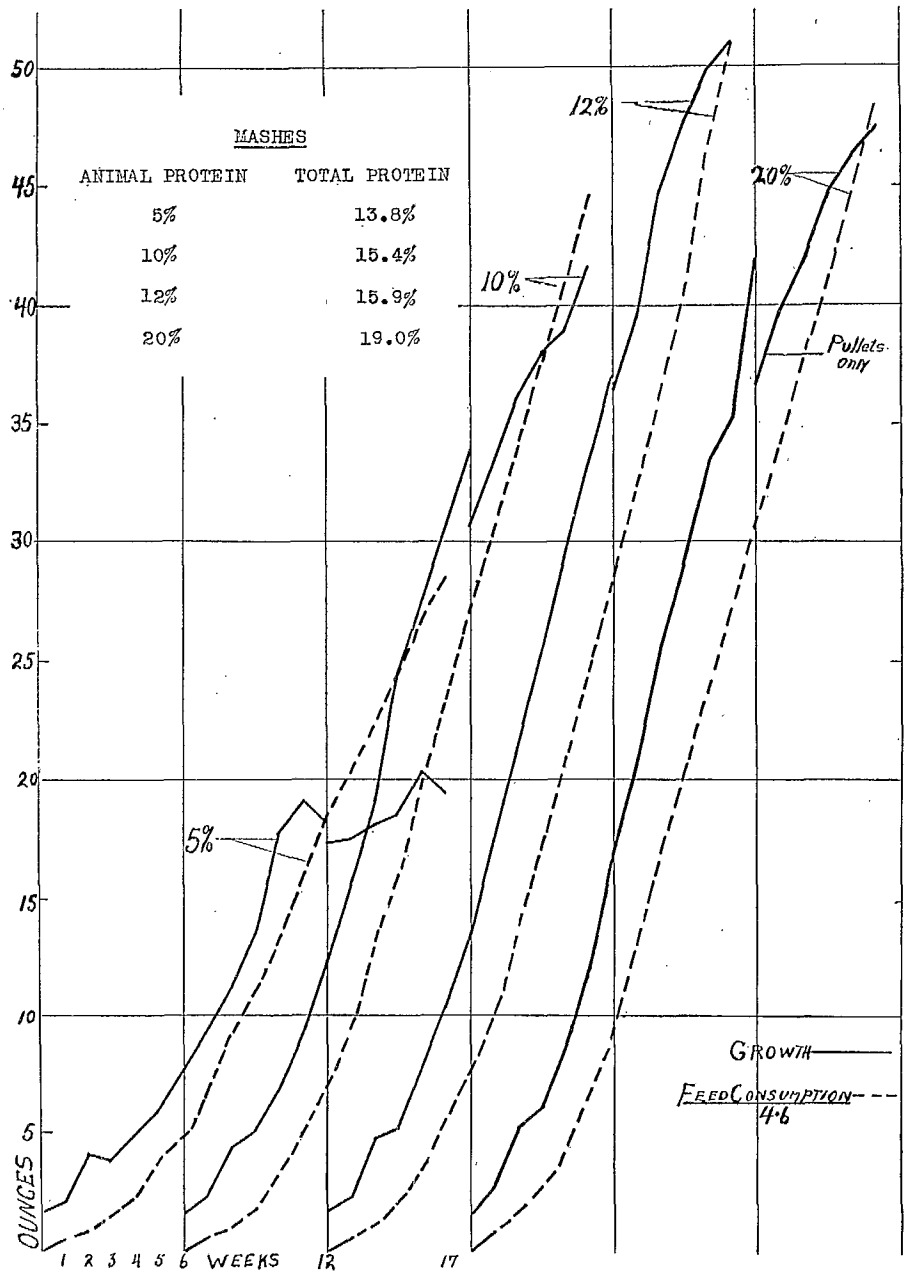

FIG. 1.—Graph showing growth and feed consumption to seventeen weeks for each pen. Feed consumption divided by 4.6 in each case.

TABLE 3.—VARIATION IN AMOUNT OF ANIMAL FEEDS FOR GROWTH PRODUCTION

Pen	Number of birds	Per cent mortality	Average weight at beginning	Average weight at end	Gain per chick	Per cent gain per chick	Total feed consumption per chick	Gain per pound of feed
			oz.	oz.			oz.	oz.
5 per cent animal feeds	45	17·78	1·67	19·24	17·57	1,052·09	131·84	2·13
10 per cent animal feeds	46	8·70	1·67	41·73	40·06	2,398·80	205·24	3·12
12 per cent animal feeds	45	8·89	1·69	51·19	49·50	2,928·99	235·54	3·36
20 per cent animal feeds	47	8·51	1·68	47·00	45·32	2,697·61	222·33	3·26

As indicated by the growth curves as shown in the above graph, very poor growth was obtained on the low protein ration containing 5 per cent of animal feeds. It would appear that this ration was fairly adequate for the production of growth up to the age of ten weeks, although even up to this period it was very inferior to the other rations as shown by 17·72 ounces, 27·47 ounces, 29·56 ounces, and 33·43 ounces per bird for the different pens in ascending order of animal feed content at that age. From ten weeks on the 5 per cent ration practically failed altogether to support growth.

It is apparent that the 10, 12, and 20 per cent rations were quite adequate to support growth, with the 12 per cent mash giving the most uniform and greatest growth up to the end of the experiment. The lack of uniformity in the other pens is indicated by the fact that the growth line wavers considerably and by the difference in the weights of pullets and cockerels at time of separation. There is no doubt but that this matter of uniformity of growth is important from the standpoint of the efficiency of the ration and is the outstanding feature of the results from the 12 per cent ration in this experiment. As shown in the table, the average weight attained at seventeen weeks by the birds of each pen was 19·24 ounces, 41·73 ounces, 51·19 ounces, and 47 ounces respectively. The total feed consumption for the same period was 131·84 ounces, 205·24 ounces, 235·54 ounces, and 222·23 ounces respectively. Reference to the graph indicates that efficiency of use of food runs closely parallel to the growth produced. Almost equally efficient use of food was made by the 12 per cent and 20 per cent pens. On the basis of amount of gain made per pound of feed consumed we have 2·13 ounces, 3·12 ounces, 3·36 ounces, and 3·26 ounces of gain respectively.

The birds receiving the 5 per cent mash developed very unevenly from the start, the following notes indicating their apparent condition at seven weeks of age:—

"Two chicks down on legs—all birds extremely nervous—very uneven development—one bird with slip tendon."

Although 1 per cent of crude cod liver oil was fed to these birds throughout, their general condition was fairly typical of extreme rickets as often produced at this Division through straight vitamine D deficiency. It is apparent that the deficiency present in this ration (5 per cent animal feeds), whether it was protein, mineral or otherwise, was sufficient to so lower general metabolism that the chick was unable to take advantage of the sufficiency of calcium, phosphorous and vitamine D present to build up proper bone. The hock joints of these chicks were visibly enlarged and the bone could be cut readily with a knife in the manner of cartilage. At fifteen weeks of age it is noted: "50 per cent of chicks have ruffled feathers and a large percentage of these are stilty gaited."

Excepting for high mortality in the pen on 5 per cent animal feed mash, mortality was neither high nor significantly different between pens.

Slip tendon, a trouble commonly met with in battery brooding, occurred to the extent of seven chicks, one, three, one, and two in each of the pens respectively. Due to confinement on wire or to faulty nutrition or a combination of

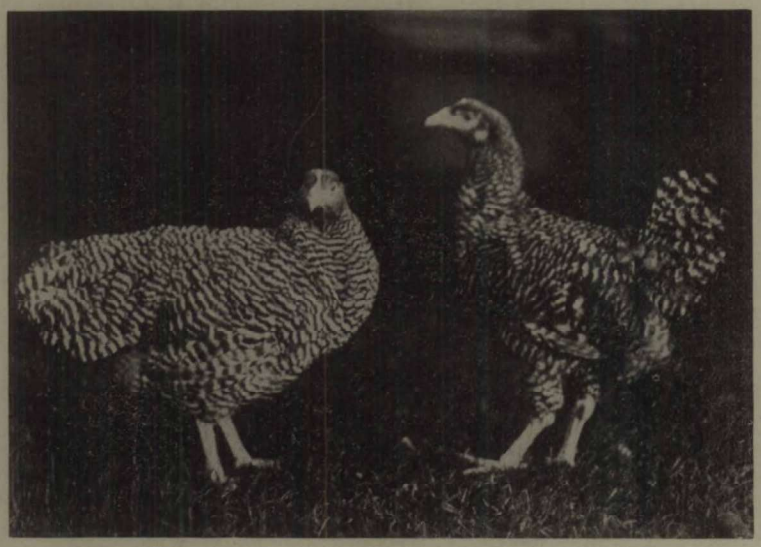

FIG. 2.—Typical pullets at seventeen weeks on the 12 per cent animal feeds ration.

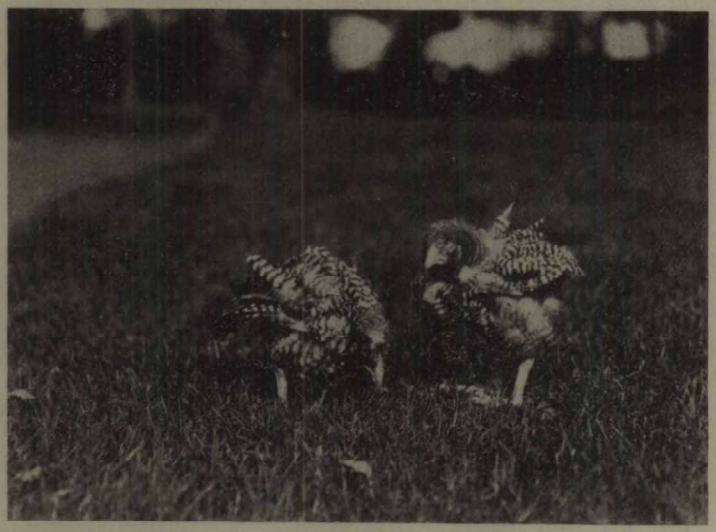

FIG. 3.—Birds illustrative of the condition found in the battery chicks on 5 per cent animal feeds (17 weeks).

these factors, it consists in the slipping of the large tendon at the back of the hock joint around to the side of the joint, the limb turning out at almost right angles to the body. Although no special precaution was taken to prevent this trouble, its occurrence was of little consequence in this test.

The work as above reported consists mainly of preliminary work incidental to a more detailed study of protein requirements and final conclusions are not justified upon the data presented to date.

An interesting comparison presented itself in that Barred Rock pullets reared under normal conditions were one-quarter pound heavier than the pen on a similar ration in the battery, namely, the 12 per cent. At this age their weekly growth was just double that of the battery pullets. In appearance, there was much in favour of the outside-reared stock. The battery birds, when put on free range after their seventeen weeks of confinement, lost weight the first week and gained very slowly thereafter. It would appear that close confinement in batteries with its restricted opportunity for exercise and probable lack of really fresh air strongly militated against proper development of these pullets to the age to which they were raised.

THE EFFECT OF SUNLIGHT UPON THE GROWTH OF CHICKS

Work under this head was continued during the past season and represents the most complete and comprehensive of the brooding experiments. Unfortunately, owing to the fact that bone analyses for both the 1929 and 1930 experiments have not yet been completed by the Division of Chemistry, this work will not be reported at this time.

OVERSEAS MARKETING OF WHITE LEGHORN CAPONS

On account of the small size of Leghorn fowl, they are little in demand for table use other than as broilers. Since the Leghorn male's flesh is of a quality which takes on mature firmness at an early age, it has been recommended and has become common practice to market Leghorn fowl at this age rather than as fryers or roasters. As a result early cockerels draw a good price as broilers, but for the bulk of the crop, which is the later hatches, a glutted market makes the returns obtained often not even sufficient to pay feed costs in rearing.

In sections of intensification of poultry, such as is the case in British Columbia and Ontario particularly, it has been a common practice to destroy Leghorn cockerels as soon as apparent or at four to six weeks of age. This means considerable economic waste since the cost of incubation, brooding and feeding these chicks up to this time is complete loss and must be charged against the cost of raising pullets.

In order to determine what measures, if any, might be taken to prevent this waste and if possible turn loss into profit, experimental work was started in 1927, in the caponizing of White Leghorn cockerels and carrying them over until the Christmas market. The results obtained were published in detail in the annual reports of this division for the years 1927 and 1928. The results of this experiment were uniform for the two years and indicated that under conditions of intensive poultry culture, the conditions under which the waste mentioned above occurs, very little, if anything, could be gained by raising Leghorn capons. For a proper understanding of whether satisfactory profits may be made by caponizing under any individual set of conditions, it will be necessary to study carefully the results of these experiments in the reports mentioned above.

In view of the results obtained it was arranged to make shipments of Leghorn capons to outstanding produce firms in England to find out whether a market might not be built up for this type of poultry meat at good prices in that country.

During 1928 an experimental shipment of choice Leghorn capons was sent to England. These were declared by the receivers to be in good flesh and of

excellent quality. Objection was taken, however, first, to the yellow pigment of the fowl, since the British market demands a white-fleshed bird, and secondly to the presence of spurs, which militated against an attractive appearance in the eyes of the English consumer.

During 1929, a large number of White Leghorn capons was raised, care being taken to use barley in place of corn products in the growing and fattening ration. It is interesting to note that the birds during this season developed and fattened much better than in previous years. At time of caponizing (ten weeks) the spurs were killed in the same way as is done with the horns in calves by cutting off the top of the spur button and rubbing with a stick of caustic potash (KOH). This method proved 100 per cent efficient at that age. Since the best prices for poultry meat are obtained during February on the English market, the capons were put in cold storage until that time. Upon arrival in England, the quality and flavour was adjudged excellent. Although the flesh was whiter than previously, it was still slightly objectionable to the particular buyer. Satisfaction was also expressed at the complete absence of spur. There was no doubt, according to the produce merchants, that these birds would be very acceptable to the English market.

The financial returns, however, were disappointing. The price paid was no higher than prevailing prices of the same quality of poultry meat upon Canadian markets. In fact, for poultry meat of such quality considerably better prices have been paid upon the local market. When the costs of packing, cold storage, and shipment are considered, the venture would be obviously unprofitable. The condition of the domestic market contributed in a measure to this result mainly because there were nearly four million pounds less of poultry in Canadian storage in February this year than at the same time the previous year. As a consequence, the price obtainable for the capons here was higher than is normal. Again, continental competition and particularly Russian, as pointed out by one of the British produce merchants, makes the price obtainable on the English market even for high-quality poultry considerably lower.

It is apparent from the results of this experiment that at the present time it would not be economically sound to consider the exportation of high-quality fowl to the British market even though the Leghorn capon should represent a considerable surplus on this market. Holding and transportation costs are too great. The experiment has shown, however, that this class of fowl can be laid down in England in quality such as demands a good price if the product is standardized according to English requirements. Should such circumstances arise that an appreciable spread is available between the English and Canadian prices of this product, it would appear to be sound business to take advantage of the field laid open by this work. Even though little if any profit could be obtained, it would have the effect of removing a possible surplus from the local market.

FIRST YEAR EGG PRODUCTION OF BIRDS REARED IN CONFINEMENT

VARIED FEEDS AND TREATMENT

During 1929, a group of birds was raised in confinement from hatching date to maturity upon the following treatment (see annual report of this division for 1929):—

Pen 1.—A control pen receiving the basal ration as follows: a commercial scratch grain mixture twice daily plus a dry mash made up of 100 pounds each of shorts, middlings, yellow corn meal, and oat flour (ground oat groats) with 10 pounds each of bone meal, buttermilk powder, and fish meal, and 25 pounds of meat meal. To this ½ per cent of salt and 2 per cent of cod liver oil was added. The mash was available to the birds at all times.

Pen 2.—A commercial brooding and rearing ration fed as recommended by the manufacturers.

Pen 3.—A ration low in protein was fed, the animal feeds being reduced to 5 per cent of the mash instead of 12 per cent as in the control ration above.

Pen 4.—Feeds and treatment identical to the control pen except that electric lights were turned on at dusk and left on all night, giving a twenty-four-hour day.

During 1930 the pullets of these pens were carried on for six months for egg production under identical treatment to that given during the rearing period as outlined above, excepting that laying mash and grain were substituted for the rearing feeds, in the commercial pen using feeds by the same manufacturers. In the other rations bran replaced shorts and ground whole oats the ground oat groats.

FIG. 4.—Leghorn pullet reared in confinement from dam also reared and kept in confinement.

The following table shows detail of results for these birds during the first six months of production:—

TABLE 4.—DETAIL—DATE OF FIRST PRODUCTION TO MARCH 31, 1930

Pen treatment	Average weight at 1st egg	Mortality	Grain per bird	Mash per bird	Total feed	Average production per bird	Average egg size	Total weight of production	Pounds feed per pound of eggs
	lb.		lb.	lb.	lb.		oz.	oz.	lb.
1. Control	3·32	0	20·05	19·50	39·55	72·60	1·93	140·12	4·52
2. Commercial ration	3·26	9	25·72	19·03	44·75	51·57	1·89	97·47	7·34
3. Low protein ration	3·46	2	26·99	21·31	48·30	48·83	1·92	93·75	8·24
4. Electric lights (24 hours)	3·08	2	19·71	21·18	40·89	64·18	1·87	120·02	5·45

In examining the above data it will be seen that mortality was excessive in one pen. The mortality in all pens was very much lower than in other pens upon the plant, which would seem to indicate that rearing in confinement, as was done with these birds, gives a greater measure of control of diseases of

infestation than was attained with the stock reared on range. The mortality which did occur in these pens was towards the end of the period of experiment, and since the attendant looking after these birds also cared for pens heavily infested with intestinal parasites there is no doubt that infection was unavoidably carried to these pens by the attendant.

Feed consumption was least for the pens upon the basal ration. This fact is of significance since the production was greatest in these pens. It is also apparent from the low consumption that very little feeding was done by the pen on electric lights during the period of illumination since their total consumption was only slightly greater than that of the control pen.

Egg production as best indicated by the total weight of eggs produced was much the greatest for the control pen, followed fairly closely by the pen upon electric lights receiving the same ration. Production upon the commercial ration and upon the low-protein ration was quite inferior to the control. The results as indicated by pounds of feed per pound of eggs laid paralleled production results quite closely and show much greater efficiency for the birds upon the control ration.

From the standpoint of economy of production the control pen is outstanding since the mash for this pen cost $2.60 per cwt., while that of the commercial pen cost $3.30 per cwt. The low-protein ration on account of its low cost ($2.35) was much more efficient than the commercial ration from this standpoint.

Additional experiments for egg production, which comprised the bulk of the winter's experimental work, are not reported here owing to the interference of disease. At the present time the experiments for egg production for 1930-31 are under way and give promise of excellent results with low mortality.

EXPERIMENTAL WORK UPON THE BRANCH FARMS

Experimental work upon the poultry plants of the Branch Farms improves in excellence year by year. More thoroughly trained men and superior equipment are having their effect upon this branch of the work. A great variety of projects are under way upon these Farms, some of which are mainly of local significance, while others more general in nature give results of much wider application to the poultry industry in general.

A few of the more important projects which have been carried on by numerous Farms over a period of years are briefly summarized herewith:—

SKIM-MILK VS. MEAT MEAL FOR EGG PRODUCTION

Twenty-five individual experiments varying in duration from six to ten months over seven Farms have been carried on during the past five years dealing with the relative merits of these animal feeds for egg production.

Except for a very few instances skim-milk gave superior results to a marked degree. The skim-milk was fed *ad lib* as the only drink, while the meat meal was incorporated in the mash at rates varying from 12 to 20 per cent by weight.

MEAT MEAL VS. FISH MEAL FOR EGG PRODUCTION

Four Farms over a period of four years and comprising fourteen separate experiments have contrasted meat meal and fish meal as sources of animal feeds for egg production. The two feeds gave results apparently almost on a par, although fish meal was slightly superior in most instances. Each was incorporated into the mash at the same levels by weight.

POTATOES AS A POULTRY FEED

Experiments carried on by four Farms over a period of two years and comprising six distinct projects have demonstrated that small cull potatoes when ground up and incorporated into the fattening mash make an excellent fattening feed. In several instances they were substituted for corn meal and in practically every case gave superior results. In one instance the roasters produced were declared to be much more juicy and finer in flavour than the corn meal fed birds.

One farm over a period of four years has also obtained superior results in egg production by substituting ground-up cull potatoes for the corn meal of the laying mash.

CORN VS. BARLEY FOR EGG PRODUCTION

Evidence continues to pile up to substantiate results already obtained showing barley to be a satisfactory feed for egg production. When the vitamine deficiency of this grain is counteracted by suitable supplements in the form of greenfeeds such as clover and alfalfa, and cod liver oil, a summary of results upon the Branch Farms to date would indicate that barley is quite comparable to corn as a producer of eggs and is much more economical owing to its low cost.

Experiments upon housing, brooding methods, breeding, costs of production, etc., are also carried on by all farms, and greater detail of this work may be obtained by writing to the Farm or Station concerned.

CANADIAN NATIONAL EGG LAYING CONTEST

REGISTRATION AND INSPECTION

During the year 1930, thirteen egg laying contests were conducted by this division. The Canadian Contest was conducted at the Central Farm. This contest is international in scope. The remaining twelve contests are provincial in nature and were conducted on Experimental Farms or Stations in the various provinces.

TABLE 5.—Name of Contest and Number of Birds: Average egg production per bird; average points per bird; leading pen, production and points of highest registered bird in each Contest, 1929-30

Contest	Number of birds	Average eggs per bird	Average points per bird	Leading pen number of points	Highest registered bird	
					Eggs	Points
Canadian	790	170·5	165·4	2,176·0	249	287·8
Prince Edward Island	200	175·6	185·7	2,164·2	244	279·9
Nova Scotia	240	184·4	183·2	2,494·9	280	306·2
Nova Scotia Southern	200	180·0	181·9	2,152·9	264	296·3
New Brunswick	200	202·6	202·8	2,349·8	313	334·3
Quebec Eastern	190	166·5	167·3	2,222·3	251	286·1
Quebec Western	190	171·6	181·0	2,371·8	283	301·5
Ontario	600	161·7	155·7	2,098·7	248	271·6
Manitoba	300	171·1	174·0	2,297·0	252	290·6
Saskatchewan	370	162·4	173·3	2,178·7	253	289·8
Alberta	240	174·7	183·6	2,403·2	268	308·9
British Columbia	460	201·0	214·9	2,770·2	349	406·3
Vancouver Island	340	210·5	220·1	2,660·3	306	351·1
Total	4,320	178·1	181·0	.....	.....	.....

NOTE.—Ten birds constitute a pen.

28070—3½

TABLE 6.—NUMBER OF BIRDS AND AVERAGE PRODUCTION OF ALL CONTESTS

Variety	Number of birds	Average egg production	Average points
S. C. White Leghorn	1,820	177·9	182·0
Barred Plymouth Rock	1,740	181·6	176·4
S. C. Rhode Island Red	280	184·1	191·3
White Wyandotte	270	171·5	174·7
White Plymouth Rock	110	151·7	155·1
Ancona	40	149·1	149·5
Light Sussex	20	155·9	153·6
Australorp	10	180·2	167·2
Buff Orpington	10	145·9	154·2
S. C. Brown Leghorn	10	141·9	117·7
Black Minorca	10	127·4	146·5
Total and average	4,320	178·1	181·0

The Canadian National Egg Laying Contest has been in operation for eleven years and a review of the work is worth while. Table 7 gives the number of birds entered each year, together with the average production.

TABLE 7.—BIRDS ENTERED IN CONTEST—BY YEARS

Contest year	Total number of birds	Average production per bird
1919–20	1,610	122·5
1920–21	2,480	137·0
1921–22	2,590	146·3
1922–23	3,000	164·3
1923–24	3,710	169·6
1924–25	4,100	172·2
1925–26	4,220	179·5
1926–27	4,210	172·5
1927–28	4,230	175·4
1928–29	4,370	176·5
1929–30	4,320	178·1

The figures in the foregoing table show the gradual increase in number of birds each year. The number of birds in contests has remained fairly constant since the 1925-26 contest. This condition can be attributed wholly to the lack of contest accommodation, as during the past four years no additional contest pens have been built. The number of poultry breeders desirous of entering birds in laying contests has always been in excess of the pens available. This is especially true in the provinces of New Brunswick, Ontario, and British Columbia, and in the Canadian Contest.

1930-31 CONTESTS

The 1929-30 contest year ended October 23, allowing one week for returning the birds, cleaning the pens, and putting in the incoming birds. Another series of egg laying contests commenced November 1, 1930. A new contest was started at Harrow, Ont., known as the Ontario Western Egg Laying Contest. At present there are 4,790 birds in 479 pens and 958 spare birds, making a total of 5,748 birds in all contests.

REGISTRATION

During the year 1,527 birds were registered in Canada. This number was made up of 322 males and 1,205 females. Registration is granted to males which are bred from second and subsequent generation females and from

approved or registered males. These cockerels must be at least six months of age and be worthy specimens of the breed they represent. Registration was granted to all females which laid 200 eggs or over in any of the Canadian National Egg Laying Contests, providing the eggs laid averaged 24 ounces or over to the dozen and the birds were typical of the breed and free from standard disqualifications. Birds which laid eggs with shell colour not characteristic of the breed were disqualified and refused registration.

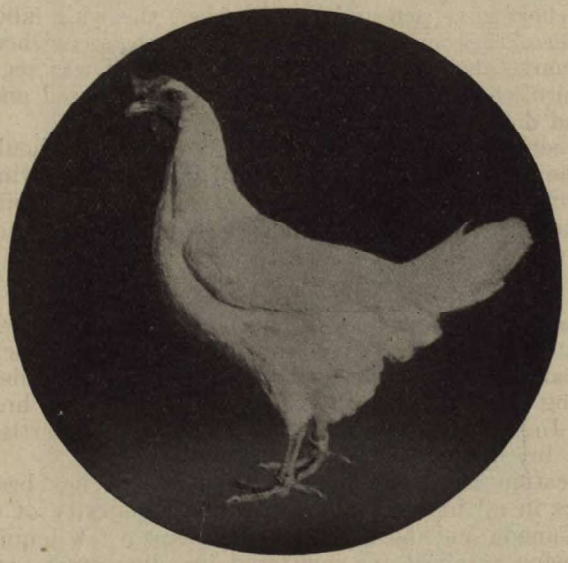

FIG. 5.—Nodrone 5H (8462). This registered bird laid 357 eggs in 365 days, 26 ounces to the dozen, in the Agassiz Egg Laying Contest, 1929-30.

During the year 1930 the breeders using registered birds in their breeding work were as shown in the following table:—

TABLE 8.—DISTRIBUTION OF BREEDERS AND REGISTERED HENS

—	Breeders	Registered hens
Prince Edward Island	10	56
Nova Scotia	6	37
New Brunswick	24	160
Quebec	21	144
Ontario	68	335
Manitoba	14	104
Saskatchewan	12	65
Alberta	17	76
British Columbia	80	735
Total	252	1,712

REPORTS

At the end of each week a report was sent out from each office where an egg laying contest was held giving the individual production of each bird for the week. These reports also gave the total eggs and points to date. Reports were sent to all contestants and interested parties, not only in Canada, but in the United States as well. In addition to those already mentioned the mailing

list included many poultry breeders and egg laying contest managers in England, Ireland, Scotland, France, Holland, Australia, New Zealand, and South Africa.

A four-weekly report of eggs laid was also compiled and sent to the Canadian poultry press.

At the completion of the 1929-30 contest year a production and identification chart was prepared and sent to each breeder giving him important detail in connection with the performance of his birds while in the contest. The information on the chart gave pen and bird number, the wing label numbers if she was the daughter of a second or third generation registered hen, the flock name and breeder's mark, also the tattoo mark if the bird was registered, the body weight of the bird, the number of eggs laid, points secured and average weight of eggs laid, and disqualifications if such were present.

With such complete information at hand the breeder should be prepared to act wisely in the mating up of his registered hens the following season. These charts are especially useful in determining the worth of a bird not only from her egg-producing ability, but also from the standpoint of the size of egg and size of bird as well.

THE BLUE BOOK

The third annual breeders' catalogue, known as the Blue Book, was issued by the Canadian National Poultry Record Association in December, 1930. This Blue Book contains the constitution of the association, the rules and regulations of the egg laying contests, and articles relating to poultry breeding and registration work. In addition, the Blue Book contains advertisements from the leading poultry breeders throughout Canada.

This publication has become quite popular and has been distributed to poultry breeders in all parts of the world. The majority of copies have gone to breeders in Canada and the United States. Not a few inquiries from outside countries are being received for registered breeding stock, and business with reliable poultry breeders is ever on the increase.

INSPECTION

During the year 1930 five registration inspectors have been engaged in the work of inspection of registered stock.

Inspections were made for the purpose of:—

1. Identifying (by means of breeders' registered tattoo marks) as qualified registered stock, the females mated for the season's hatchings.
2. Approving as to standard quality and fitness the males mated to registered females.
3. Examining trap-nests and hatching records and instructing breeders as to the best methods of handling same.
4. Checking up and identifying the sealing of bands on all chicks within a given time after hatching.
5. Examining and labelling those pullets that are qualified to enter a contest and to pass and tattoo qualified cockerels from registered matings.
6. Inspecting new breeders desirous of entering laying contests and tattooing all qualified females in the contests at the completion of the contest year.
7. Wing labelling pullets for Registration Progeny Test, checking up on the work during the year, and tattooing qualified females.
8. Giving advice and instruction, when desirable, to the breeders in the carrying on of their pedigree breeding work.

As the work with registered poultry goes on from year to year it is interesting to know that intelligent effort on the part of the breeders to advance the quality of their stock is having its reward. The most successful breeders soon realized that their most hearty co-operation with the inspector in carrying out

the program as outlined was the surest and most rapid way to success. At the present time the fullest co-operation exists between the breeder and the inspector. The remark often heard is, "Why does the inspector not make more visits to the flocks doing work under the registration plan?"

To those most closely associated with the work it is clear that even at this early date (the eighth year of registration) the calibre of the breeder and the consistent performance of his birds is quite evident in the laying contests.

NUMBER OF REGISTERED HENS MATED AND CHICKS HATCHED, 1930

—	Hens mated, 1930	Chicks wing banded
Prince Edward Island	56	767
Nova Scotia	37	486
New Brunswick	160	2,076
Quebec	144	2,102
Ontario	335	5,428
Manitoba	104	849
Saskatchewan	65	651
Alberta	76	685
British Columbia	735	10,298
Total	1,712	23,342

During the year 1930 there were 1,712 registered hens mated to registered or approved males. This was 285 more than was mated the previous year. The number of chicks wing banded in 1930 was larger than the previous year, there being 23,342, which was an increase of 6,433 over the year 1929. The average number of chicks per hen increased from 11·8 in 1929 to 13·6 in the year 1930.

REGISTRATION PROGENY TEST

During the year provision was made for the progeny testing of pullets from registered males and second or subsequent generation females on the breeders' plants. At present there are eleven breeders doing this work and numerous other breeders are preparing to undertake the work in the near future.

Generally speaking, the work of poultry registration has made favourable progress during the past year.

FARM, EGG AND POULTRY ACCOUNTS

The Farm, Egg and Poultry Account forms supplied by the Poultry Division have an ever increasing demand, and at time of writing are being used to advantage by farmers with flocks ranging from twenty-five to five hundred birds. Their use is not centralized but is being taken advantage of in every province of the Dominion. They tell a story that speaks of substantial profits in some cases and in others the reverse. However, many sources of loss have been stopped due to the keen observation of the farmers themselves and by the advantage offered through the correspondence side of the form.

In addition to the correspondence which is carried on regarding their own poultry problems, each subscriber to the Farm, Egg and Poultry Account forms is sent a monthly letter, outlining the management of the flock for the ensuing month, and discussing any problem which appears to be prevalent in their accounts.

As a result of a survey of the accounts for the season of 1929-30 it was found that 8 per cent lost money on the year's work, while 92 per cent had a favourable balance. The average production for the year was 132 eggs per

bird, giving an average profit from eggs of 45 cents per bird. This figure may appear rather low, but due to the cost of feed and a comparatively low price for eggs in some sections the average profit is smaller than it should be.

An average production of 132 eggs is the result of rigid culling, which has been stressed for the past few years in the circular letters sent from this division. From year to year the production increases, but yet many are having far too low averages. Some of the causes of these low averages are beyond control, but the man who uses business methods in his poultry operations will make a reasonable profit over cost of production. Our interpretation of business methods briefly, is to give the same thought and care to poultry as one would to any other business. This means a flock of producers, all non-producers being culled out and the remainder kept in clean, well-ventilated houses and fed a proper ration. To help in carrying this out is the object of this service department.

DEMONSTRATIONS AND EXHIBITS

Educational exhibits were erected at the following shows: Central Canada Exhibition, Ottawa; Canadian National Exhibition, Toronto; Western Fair, London. These exhibits consisted of explanatory panels, transparencies, appropriate legends, and in some cases live birds showing the result of pedigree breeding work. The Division of Extension and Publicity used a panel devoted to poultry at all the Class A fairs on the 1930 Western Show circuit.

An exhibit made up entirely of registered birds from the provinces of New Brunswick, Quebec, Ontario, Alberta, and British Columbia was erected at the Royal Winter Fair, Toronto. This exhibit did much to promote registration work, and was the means of spreading considerable literature among poultrymen.

FIG. 6.—Exhibit of the Canadian National Poultry Record Association at the Royal Winter Fair, Toronto, 1930.

At Windsor, London, Picton, and the Quebec Provincial Poultry Show held at Montreal, poultry exhibits were featured. The exhibit used at the above shows was very attractive and highly educational. It consisted of two panels with a bulletin machine in the centre. One panel was devoted to body weight and its correlation to egg production and egg size. In the foreground was a set of steps, with model hens ranging from 2½ to 4½ pounds, one hen placed on each step. Under each was an illumination, giving the average production of the bird above. The other panel was devoted to registration, its advantages and importance. In the foreground of this panel were placed three registered birds, one female and two of her male progeny. This section of the exhibit attracted considerable attention. The centre space was allotted to a bulletin machine, with pictures and legends, on management, range conditions, feeds, housing, etc. At the above-mentioned shows there was a very brisk demand for literature and information. The interest taken in these exhibits leaves no doubt as to their usefulness. They form a valuable medium for the dissemination of information from this division; also they establish a point of contact between the Experimental Farm and the farmer or poultry breeder.

THE WORLD'S POULTRY SCIENCE ASSOCIATION AND CONGRESS

Since the Dominion Poultry Husbandman as President of the World's Poultry Science Association and First Vice-President of the Fourth World's Poultry Congress held in London this year, presided at all the association meetings and at the congress business sessions, a brief report of what occurred at these meetings, and of the Canadian exhibits at the congress, might find a place in this annual report.

The World's Poultry Science Association is the parent of the congresses and the Association Council is the medium by which matters decided upon at the congress meetings are conveyed to the countries or bodies interested or passed on to the succeeding triennial congress.

The business sessions of the London Congress were of much more interest than those of any previous congress, partly because it was in London but more because from the sixty-three countries came delegates who felt that this was an organization through which worldwide action could be secured.

The president elected for the next term, commencing January 1, 1931, was State Konsultant W. A. Kock of Denmark, the retiring president being made an honorary past president. Prof. J. E. Rice of Cornell University, U.S.A., was apointed first vice-president for America. The Hon. W. R. Motherwell, Minister of Agriculture in Canada at the time of the 1927 congress, was designated a life member of the association.

The invitation from the Italian Government to hold the 1933 congress in Rome was accepted.

A resolution of thanks was passed to the Canadian Government for making it possible for the president to visit so many countries in the interests of the association, and the congress, since his appointment.

Among other resolutions that were passed by the congress and the council and sent on to the interested governments were those dealing with:—

The urgent importance of compiling poultry statistics.

Eggs cold or gas stored in any European country should be stamped by an internationally agreed mark.

The danger of the importation of "psendo fowl-pest" with the aim to suitable measures being taken for its exclusion and control in each country.

That governments operating egg laying tests be asked to consider the advisability of introducing grams instead of ounces.

That each national exhibit to a congress be accompanied by a short descriptive booklet.

THE CONGRESS EXHIBITS.—The congress was staged in the Crystal Palace, and in spite of its tremendous size the space was more than taken up with exhibits, national and commercial. The congress was officially opened by H.R.H. the Duke of York, and the many functions tendered the guests were of a very high order.

Canada was represented by twenty officially named delegates, and by nearly 200 others who attended the congress and took in the post-congress tours. The Canadian exhibits reflected great credit upon Canada, and Mr. O. Turcotte and Mr. F. C. Nunnick were given much praise for the manner in which these exhibits were arranged. The exhibits included:—

(1) The National Educational exhibit, depicting in a very spectacular way Canada's possibilities. The poultry work was emphasized by huge eggs automatically appearing out of the earth's surface, the shell upon breaking exposing to view breeding pens of Canada's superior birds. This exhibit was most striking, and throughout the congress the centre of interest.

(2) Provincial exhibits, where each province, or in some cases a group of provinces, had space to display the attractive features of the province or section.

(3) Commercial exhibits, which included displays from the Canadian Egg Pool, the R.O.P. Association of British Columbia, etc.

(4) The Prince of Wales' ranch.

(5) The World's Grain Congress to be held in Canada in 1932.

(6) The Live Bird Exhibit.—This was under the management of Mr. George Robertson, and also was a distinct credit to Canada. About 750 Canadian birds were sent over, and their good health, their vigour and wonderful constitution, along with their excellent breeding created no small interest. Many of these were sold at good prices and went to various countries throughout the world.

REVISION OF BULLETINS AND CIRCULARS

During 1930 several of the publications of this division were revised and two new bulletins issued.

Bulletin No. 87—Principles of Poultry House Construction, was thoroughly revised and brought into line with recent developments, becoming Bulletin No. 132, New Series—"Poultry House Construction." Detailed plans and specifications for many types of houses, and equipment are shown, together with explanatory material.

Circular No. 35—Brooding and Rearing of Chicks, was also completely revised and becomes Circular 76.

Bulletin No. 20—Preparing Poultry Produce for Market, was replaced during the year by Pamphlet No. 125—New Series, entitled "Preparing Poultry for Market." This pamphlet was prepared in co-operation with the Poultry Division of the Live Stock Branch and the Publications Branch, both of the Department of Agriculture, Ottawa.

A new pamphlet, No. 128—New Series, entitled "Canadian Grown Grains in Poultry Feeding," was issued during the year in order to set forth the facts as known at present relative to the feeding value for poultry of the more commonly used Canadian grown grains.

These publications are all available free upon request to the Publications Branch, Department of Agriculture, Ottawa.

REPORT OF THE POULTRY PATHOLOGY LABORATORY OF THE HEALTH OF ANIMALS BRANCH FOR THE POULTRY YEAR ENDING OCTOBER 31, 1930

By Dr. C. H. Weaver

*ROUTINE LABORATORY SERVICE

Laboratory diagnoses cover a total of 1,884 specimens, being a considerable increase over the 1,260·6 average for a preceding five years' period (1924-28) and a 13·5 per cent advance over last year's total of 1,659.

The incidence of the more important diseases shows some variation between the current and the preceding year; and between the former and the average for the five-years' period referred to above. The order of importance by total numbers for the five top positions for the five-year period are: Intestinal parasitism, roup, peritonitis, reproductive and pullorum. For the preceding year (1929) they are: Intestinal parasitism, roup, cannibalism, peritonitis and pullorum. The current year (1930) gives the following order: Intestinal parasitism, cannibalism, peritonitis, pullorum and avitaminosis.

Thus it will be seen that intestinal parasitism (worms and coccidiosis) has maintained the first position throughout. Roup, which occupied the second position for the five years and the 1929 year, has dropped below the first five positions for the current year. Its position during 1930 has been taken by cannibalism, which was third in 1929 and below the first five places for the five-year period. Peritonitis occupies the same relative position in 1930 as for the average, viz., third place. Pullorum disease takes fourth place in 1930 as against fifth position in both of the other periods. Avitaminosis is the new listing in fifth position for 1930.

The first position in each instance seems to indicate the relative importance of intestinal parasites as the cause of mortality in poultry. If the current year's figures can be taken as indicating a trend it would suggest the reduction in importance of roup, but on the other hand a stepping to the fore of pullorum disease. Regarding the latter disease it seems relatively important to note that 6·26 per cent and 6·02 per cent of the total examinations respectively for the five-years' period and the 1929 year were recorded, as against 8·33 per cent for the current year. This increase occurs despite the fact of pullorum disease having been eliminated from the comparatively large flock with which this laboratory is associated, where thereby the chick mortality of slightly less than 30 per cent has been reduced to less than 4 per cent of the thousands of chicks hatched and brooded annually, and with the examination of the majority of the dead chicks not a single case of pullorum was encountered during the current year.

The five-years' period and the 1929 year each has two contagious diseases in the first five positions, whereas 1930 has but one.

Table A1 gives in table form the first five listings for the period 1924-28, 1929 and 1930.

Table A1.—Disease Incidence, First Five Positions

Position	1924-28 (5 years' average)		1929		1930	
	Disease	Per cent	Disease	Per cent	Disease	Per cent
1	Int. Parasitism	20·68	Parasitism	17·60	Parasitism	19·92
2	Roup	9·63	Roup	11·69	Cannibalism	16·36
3	Peritonitis	7·42	Cannibalism	11·15	Peritonitis	11·03
4	Reproductive	6·58	Peritonitis	8·61	Pullorum	9·31
5	Pullorum	6·25	Pullorum	6·02	Avitaminosis	8·64

* This report is included herewith by courtesy of the Health of Animals Branch.

Table A2 lists the total examinations for the year. Tabulations are made monthly under the chief or more common disease headings, with percentages of the total mortality for each. The specimens listed as undetermined and miscellaneous have been eliminated when calculating the individual disease percentages.

The peak occurs in the month of February, with 14·7 per cent of the annual total. It is of interest that the peak of each major disease listing, with but two exceptions, occurs between February and April, inclusive.

TABLE A. 2—AUTOPSY REPORT YEAR ENDING OCT. 31, 1930

Item No.	Disease	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Totals	Per cent
1	Intestinal parasitism—pathological	45	40	42	48	13	9	9	25	15	15	27	37	325	19·92
2	Roup and chicken pox	.....	.....	.....	.....	.....	2	.....	1	.....	.....	.....	.....	3	0·18
3	Roup only	.....	5	2	9	3	12	3	8	7	7	7	6	69	4·22
4	Pox only	.....	.....	2	.....	6	7	.....	6	4	.....	.....	.....	25	1·53
5	Infectious bronchitis	1	3	24	103	3	.....	2	.....	.....	.....	.....	.....	136	8·33
6	Tuberculosis	2	3	3	.....	1	2	1	2	1	.....	2	5	22	1·34
7	Pullorum	2	.....	.....	.....	.....	30	66	47	7	.....	.....	.....	152	9·31
8	Pericarditis	.....	3	3	4	2	2	2	.....	1	1	1	.....	19	1·16
9	Vent gleet	.....	1	.....	1	9	.....	2	4	.....	.....	1	.....	18	1·10
10	Peritonitis	9	7	15	19	8	40	26	17	10	10	8	11	180	11·03
11	Reproductive	3	5	2	3	15	10	3	3	2	5	4	1	56	3·43
12	Avitaminosis	1	5	9	13	38	12	13	14	12	10	7	7	141	8·64
13	Cannibalism	15	21	40	49	5	37	49	26	12	8	1	4	267	16·36
14	Hemorrhage	3	3	3	5	2	9	1	.....	3	2	3	1	35	2·14
15	Visceral gout	2	.....	.....	3	5	4	2	4	.....	.....	1	1	22	1·34
16	Digestive and liver	4	4	9	4	3	10	3	1	5	3	2	3	51	3·12
17	Tumor	2	6	15	5	1	9	3	5	2	4	2	5	59	3·61
18	Leukemia	4	3	1	5	.....	7	.....	1	2	2	1	6	32	1·96
19	Paralysis	3	.....	.....	.....	.....	2	2	.....	2	3	1	1	14	0·85
20	Heat prostration	.....	.....	.....	.....	.....	.....	.....	1	2	1	.....	.....	4	0·24
21	Undetermined	3	3	2	1	8	45	37	25	6	2	.....	4	136	7·21
22	Miscellaneous	14	2	4	5	5	2	13	19	24	15	8	6	117	6·21
	Total	113	115	176	277	127	251	237	209	117	88	76	98	1,884	.....
	Per cent totals	5·99	6·10	9·34	14·70	6·74	13·32	12·57	11·09	6·21	4·67	4·03	5·20	.....	.....

MORTALITY STUDY

This laboratory for a number of years has been endeavouring to ascertain as accurately as possible the incidence of disease affecting the different classes of fowls, and to determine the disease conditions responsible for such losses. The importance of this information is quite obvious, for without it costly and time consuming investigations would as likely be directed against the diseases of lesser significance as those of great economic importance. With this information compiled over a sufficiently long period, with a suitable number of birds and with appropriate varying conditions it should be possible to anticipate the probable loss likely to follow any common set of circumstances. In addition thereto it forms a starting point for the application of rational disease control.

Fowls in their pullet year comprise the greater revenue producing flocks, consequently are of special importance for that reason and because they represent the total rearing cost without having produced a comparable returnable revenue, until they have passed well into this period.

Reports have been made previously on this class of fowls, using material gleaned from the laying contests because of the excellence of such material for this purpose. Table A 3 gives the actual disease group incidence of the mortality in the flocks comprising the two contests handled at Ottawa for the five years 1924-25 to 1928-29. Three group headings are used, viz., Parasitic, Specific, and Sporadic. Parasitic listings are cases where deaths were directly traceable to the ravages of one or more forms of intestinal parasites (coccidia, worms). The term specific is synonymous of contagious disease, and sporadic diseases are those of an organic nature and not due to a transmissible cause. A total of 1,262 subjects were included and arose from a fowl population of 5,810 birds, making the number sufficiently large for the figures to be significant, this particularly in view of the varied source of origin of the material. The diseases comprising each group are the same as that shown in table A 9.

The figures contained in table A 3 seem worthy of some analysis in order to appreciate their significance. By them it is apparent that the group of sporadic diseases had a preponderance over the other two groups to an extent unlikely to be anticipated. Of the total of both breeds, of both contests and for the five-year period 18·88 per cent mortality was experienced for the former, whereas 0·58 and 2·25 mortality occurred from the parasitic and the specific diseases respectively. The general similarity of this relationship throughout the years referred to, between the breeds of fowls and the two contests, indicates other than a possible chance happening. For the combined contests, the sporadic disease incidence increased but slightly less than 10 per cent between the 1924-5 and the 1928-9 contests. The Ontario contest averaged approximately $3\frac{3}{4}$ per cent lower mortality from this cause than did the Canadian contest, which, again, seemingly was not a chance occurrence because the former contest over the latter had for the Leghorns a lower incidence for each year, and for the Rocks a lower amount for each but one year.

The contagious disease totals tended to increase slightly between the first and last contests, but the parasitic diseases fluctuated only to an extent likely to occur in the numbers involved in the compilation.

The relative incidence of the three groups of diseases, that is regarding the total mortality rather than the entire fowl population, is tabulated in table A 4. The mean of the three groups was 2·69, 10·38 and 86·92 respectively for parasitism, specific and sporadic diseases. Relationship between the disease groups according to relativity was very uniform. In the sporadic disease group and the combined breeds there was a fluctuation of but 4·32 per cent between the maximum and minimum years. With the breeds separated, and between the different years there was a deviation at most of less than 10 per cent, which occurred in favour of the Leghorns in the 1925-6 year.

Continuing the study into the following year figures are presented herewith on the Canadian Contest for the year 1929-30 in table A-5, A-6, A-7, A-8 and A-9.

The production was calculated by grouping the pens according to the number of deaths per pen, the latter ranging from 0 to 9 in the original entrants. Unlimiting substitution was practised in replacement of fatalities, and no doubt some working time was lost in certain instances by failure of contestants to promptly supply replacements. As two spares were normally carried in each pen the time lost would not be very great in the usual course of events.

For both breeds and consequently for the breeds combined there was an inverse ratio between mortality and production. As mortality increased the average per pen production decreased. In the Rocks, with a per pen mortality of from 0-9 the production fluctuated from 1,945 for the former to 1,118 for the latter, or a difference of 827 eggs. The Leghorns with a maximum of 5 deaths in a pen had a maximum to minimum variation of 547 eggs. It is not to be inferred from these figures that the remaining birds in even the highest mortality pens were necessarily lower producing individuals than those in pens of lower mortality, but merely that lowering of egg returns accompanied the upward trend in mortality.

If a separation is made of the pens into two groups at an arbitrary point of high and low mortality, taking four or more for the former and three or less for the latter, then the high group, comprising 14 pens or 22·6 per cent of the contest accounted for nearly 50 per cent of the deaths. On the other hand, the remaining 50 per cent mortality was spread over 52 pens comprising the low group or 77·4 per cent of the total birds. (See table A-6.)

The contagious diseases were slightly higher in the high mortality pens, but the main difference between the two groups occurred among the sporadic diseases, with 12·11 per cent for the low and 42·85 for the high mortality pens. (See table A-7.)

Distribution of mortality among the various diseases for the high and low groups of pens is tabulated in table A-9. It fails to show, however, why certain pens should show so much higher death rate than others, as the mortality occurred among the same diseases for both groups. The high death rate pens have from 8 to 10 times the actual mortality in certain sporadic diseases over the low pens, but this is not maintained in the relative mortality for the sporadic group as a whole.

The high mortality in certain pens is more difficult to account for than if it had occurred in a relatively small number of disease causes, or in some other manner had been set apart from the losses in the more fortunate pens in this respect.

It does appear, however, that some pens are predestined to break down to a greater degree from a number of organic causes. The reason for this is not apparent at the present time. Tables A-3 and A-4 emphasize the regularity with which the sporadic group of diseases dominated the other two groups both in actual and relative mortality. The high incidence of the group may have been to some extent influenced by the presence of diseases represented in the other two groups, the diseases occurring in a non-lethal form. Thus far it has not been possible to statistically or otherwise demonstrate such a correlation. The low frequency with which certain contagious diseases affect Canadian flocks, such as cholera and typhoid, in part at least explains the comparative infrequency in deaths of the disease group to which they belong. There is the possibility of the worm and other parasitic troubles adversely influencing health to the development of organic breakdown of the subject, and in this case the parasitic mortality would not be a correct index of the morbidity from that cause. Evidence was not procurable to substantiate this possibility.

A preponderance of sporadic diseases in these groups of fowls indicates the importance of such maladies, and warrants greater consideration than has been given to them heretofore. More detailed study has been commenced in a small way, by which it is hoped to learn more about the nature of the trouble.

TABLE A 3.—ACTUAL DISEASE GROUP INCIDENCE

Source		Canadian Contest			Ontario Contest			Combined Contests		
Breed		Leghorn	B. Rock	Combined	Leghorn	B. Rock	Combined	Leghorn	B. Rock	Combined
Year										
1924–5	Parasitic	0·65	0·41	0·57	0·43	.....	0·30	0·47	0·29	0·48
	Specific	1·52	1·66	1·57	1·73	4·00	2·42	1·59	2·30	1·84
	Sporadic	16·73	15·41	16·28	7·82	15·00	10·00	13·76	15·29	14·26
1925–6	Parasitic	0·98	.....	0·68	0·83	0·71	0·80	0·91	0·27	0·72
	Specific	0·98	0·90	0·95	2·22	0·71	1·80	1·49	0·83	1·30
	Sporadic	13·52	15·00	13·97	11·11	16·42	12·60	12·56	15·55	13·41
1926–7	Parasitic	0·81	1·00	0·86	0·93	1·11	1·00	0·86	1·05	0·92
	Specific	1·22	.....	0·86	0·93	3·33	1·80	1·11	1·57	1·26
	Sporadic	20·00	25·55	21·59	16·24	14·44	15·60	17·28	20·23	19·07
1927–8	Parasitic	0·56	1·25	0·72	0·31	0·58	0·40	0·47	0·90	0·59
	Specific	5·47	3·12	4·92	0·92	1·76	1·40	3·76	2·42	3·38
	Sporadic	24·52	24·37	24·49	22·50	20·00	21·63	23·76	22·12	23·30
1928–9	Parasitic	0·23	0·41	0·29	.....	.....	.....	0·12	0·25	0·16
	Specific	6·27	2·50	4·92	0·85	3·12	1·56	3·84	2·75	3·47
	Sporadic	29·30	22·91	27·01	19·71	21·25	20·00	24·87	22·25	24·00
Combined years	Parasitic	0·66	0·56	0·63	0·50	0·53	0·51	0·60	0·55	0·58
	Specific	3·05	1·60	2·61	1·32	2·53	1·71	2·37	1·98	2·25
	Sporadic	20·66	20·27	20·54	15·82	17·60	16·82	18·75	19·11	18·88

TABLE A-4—RELATIVE DISEASE GROUP INCIDENCE—COMBINED CONTESTS

	Leghorns		Barred Rocks		Breeds combined	
	Number	Per cent	Number	Per cent	Number	Per cent
			1924–25			
Parasitic	4	3·63	1	1·63	5	2·92
Specific	11	10·00	8	13·11	19	11·11
Sporadic	95	86·36	52	85·24	147	85·96
Totals	110		61		171	
			1925–6			
Parasitic	8	6·15	1	1·66	9	4·73
Specific	13	10·00	3	5·00	16	8·42
Sporadic	109	83·84	56	93·33	165	86·84
Totals	130		60		190	
			1926–7			
Parasitic	7	4·21	4	4·59	11	4·34
Specific	9	5·42	6	6·18	15	5·92
Sporadic	150	90·36	77	88·50	227	89·72
Totals	166		87		253	
			1927–8			
Parasitic	4	1·68	3	3·57	7	2·17
Specific	32	13·44	8	9·52	40	12·42
Sporadic	202	84·87	73	86·90	275	85·40
Totals	238		84		322	
			1928–9			
Parasitic	1	4·44	1	9·90	2	6·13
Specific	30	13·33	11	10·89	41	12·57
Sporadic	194	86·22	89	88·11	283	86·80
Totals	225		101		326	
			Combined Years 1924-5–1928-9			
Parasitic	24	2·76	10	2·54	34	2·69
Specific	95	10·93	36	9·16	131	10·38
Sporadic	750	86·30	347	88·29	1,097	86·92
Totals	869		393		1,262	

TABLE A–5.—CANADIAN CONTEST 1929–1930

Substituted birds production included
Mortality figures confined to original entrants

Mortality per pen	Barred Rocks		S.C.W. Leghorns		Breeds combined	
	Number of pens in class	Average production	Number of pens in class	Average production	Number of pens in class	Average production
0	2	1,945	5	1,928	7	1,936
1	13	1,856	11	1,810	24	1,833
2	5	1,835	9	1,607	14	1,721
3	1	1,566	6	1,626	7	1,596
4			6	1,448	6	1,448
5	3	1,543	3	1,381	6	1,412
8	1	1,378			1	1,378
9	1	1,118			1	1,118

TABLE A-6.—SUMMARY OF TABLE A-5, WITH MORTALITY GROUPED

Mortality groups	Number of pens	Per cent total pens	Number of deaths	Per cent total mortality	Per cent mortality in groups	Total mortality
Low (3−)	52	77·4	68	50·74	13·03	20·30
High (4+)	14	22·6	66	49·26	47·14	

TABLE A-7—ACTUAL GROUP MORTALITY

	Low mortality group		High mortality group	
	Number	Per cent	Number	Per cent
Parasitic	2	0·36	1	0·71
Specific	3	0·57	5	3·57
Sporadic	63	12·11	60	42·85

TABLE A-8.—PRODUCTION FIGURES—ACCORDING TO HIGH AND LOW MORTALITY GROUPING

	No. pens	Production	Per cent
Low group	52	92,651	48·94
High group	14	19,967	39·18

TABLE A-9.—MORTALITY CAUSES

Canadian Contest, 1929-30 (Original entrants only)

No.	Disease	Barred P. Rocks		S.C. White Leghorns		Breeds combined			
		Low group	High group	Low group	High group	Low group	High group	Per cent low	Per cent high
1	Intestinal parasitism	1	1	1	.....	2	1	0·32	0·59
2	Roup and pox	.....	.....	.....	.....	.....	.....	.....	.....
3	Roup	.....	.....	3	3	3	3	0·48	1·77
4	Pox	.....	.....	.....	1	.....	1	.....	0·59
5	Tuberculosis	.....	.....	.....	.....	.....	.....	.....	.....
6	Pericarditis	.....	1	.....	.....	.....	1	.....	0·59
7	Vent gleet	.....	.....	.....	.....	.....	.....	.....	.....
8	Peritonitis	7	5	10	6	17	11	2·72	6·54
9	Reproductive	.....	2	2	2	2	4	0·32	2·36
10	Avitaminosis	.....	4	4	7	4	11	0·64	6·54
11	Cannibalism	.....	.....	14	6	14	6	2·24	3·59
12	Hemorrhage	4	2	2	1	6	3	0·96	1·77
13	Visceral gout	1	.....	2	.....	3	.....	0·48	.....
14	Digestive and Liver trouble	3	6	1	1	4	7	0·64	4·16
15	Tumor	1	4	1	2	2	6	0·32	3·59
16	Leukemia	.....	.....	2	2	2	2	0·32	1·18
17	Paralysis	.....	1	.....	1	.....	2	.....	1·18
18	Heat prostration	1	.....	.....	.....	1	.....	0·16	.....
19	Undetermined	5	5	3	3	8	8	1·28	4·76
	Total	23	31	45	35	68	66	13·03	47·14

INFECTIOUS BRONCHITIS OF FOWLS

(Laryngotracheitis)

There is a group of disease conditions affecting the inner parts of the head, throat and lungs of fowls about which considerable confusion exists as to the relationship between the different numbers and the pathological changes ascribable to each. The so called infectious bronchitis is one of this number. A further brief consideration of certain phases of infectious bronchitis is being presented with the object of throwing additional light on the subject.

It is generally agreed that the primary disease process involves the upper larynx and the trachea, but differences of opinion do exist, however, regarding just what changes to these parts may be rightly classed as resulting from this malady and the structural derangement associated with some other disease process. This is only to be expected as a similar disagreement existed regarding the common respiratory disease of fowls before the appearance of infectious bronchitis to still further complicate the situation. Until such time as the cause of each abnormality is definitely and unquestionably established resort will need be made to the accumulated clinical evidence, obtained by close observation of the symptoms presented by birds suffering with the varied conditions, and the supporting facts obtained at autopsy regarding the associated pathological changes, as a basis of understanding.

When infectious bronchitis first appeared in this country it was immediately recognized as a disease manifestation quite separate and distinct to anything previously experienced. It was characterized by suddeness of onset, alarming symptoms of dyspnoea accompanied by coughing and strangling. Blood was generally raised to some extent. Suffering individuals unless obtaining relief early would succumb to the haemorrhage in the lung accompanying the trouble. Individual birds with such a violent condition rarely showed evidence of a roup-like character, but in most outbreaks some individuals, both before the appearance and following the disappearance of regular cases, would be met with showing the usual roup manifestations. Distressing symptoms seemingly arose mainly from the lung haemorrhage, and promptly subsided once the outpouring of blood ceased. Birds in the best physical condition were the ones most likely to succumb. At autopsy the most constant lesion was a quantity of extravasated blood in the lung, some in the form of clots raised to various points between there and the mouth. Death frequently resulted from a clot blocking the main branches of the bronchial tubes. Some degree of inflamation was usually in evidence in the superior larynx and the adjacent part of the trachea. There was some reason for believing that this throat lesion was the point of infection and that the lung haemorrhage may have resulted from some toxic material originating in the throat.

In following the course of the disease in the Poultry Division pullet year flocks, subsequent to the first year's occurrence of the disease, there is no doubt but that there has been a gradual change between then and the present time manifestations. This change in disease manifestation may be the result of changes in character of the cause of the disease, or through better knowledge of the nature of the malady there have been developed altered methods of flock handling which make the birds less susceptible to the full effects of the trouble, or still a combination of both. If the disease is due to a specially altered strain of a previously existing organism it is but reasonable to expect it to eventually return to somewhat near its original state.

At the present time in the flock referred to the earlier acutely haemorrhagic form is of comparatively rare occurrence, with a corresponding drop in the mortality which formerly occurred at the inception of an outbreak of the trouble. Latterly the conditions which formerly characterized the disease may

FIG. A1.—Infectious bronchitis (laryngotracheitis). Intense acute inflammation of the upper larynx, causing the organ to protrude from the mouth.

FIG. A2.—Infectious bronchitis. Same subject as in Fig. A1. The opening to the larynx through which the bird breathes appears directly below the point of the upper beak. The point protruding below this opening is the bird's tongue, which is also forced out of the mouth as the result of the swelling of the affected parts.

be seen in but very few individuals when trouble first occurs, then entirely disappear, to be followed by a continuation of roup-like disease processes. That is, the formation of false membranes in the larynx and other well-known similar lesions about the head.

Figs. A-1 and A-2 represent a heretofore unreported form of the disease. As a result of the inflammation in the throat and the consequent swelling of the parts the entire larynx and tongue have been forced out of the birds' mouth.

Fig. A-3 shows the exposed inner aspect of the larynx and trachea. The larynx had a small quantity of caseous material, as a false membrane, attached to its inner surface (seen as a light coloured area at the top of the pinned back portion). There was not sufficient accumulated material to seriously affect the subject's breathing. Beneath the false membrane and extending downward towards the lung the mucous membrane was intensely engorged with blood, with some extravasation into the tissue and some haemorrhage on the surface. These blood clots appear in the photo as darkened areas between the rows of pins.

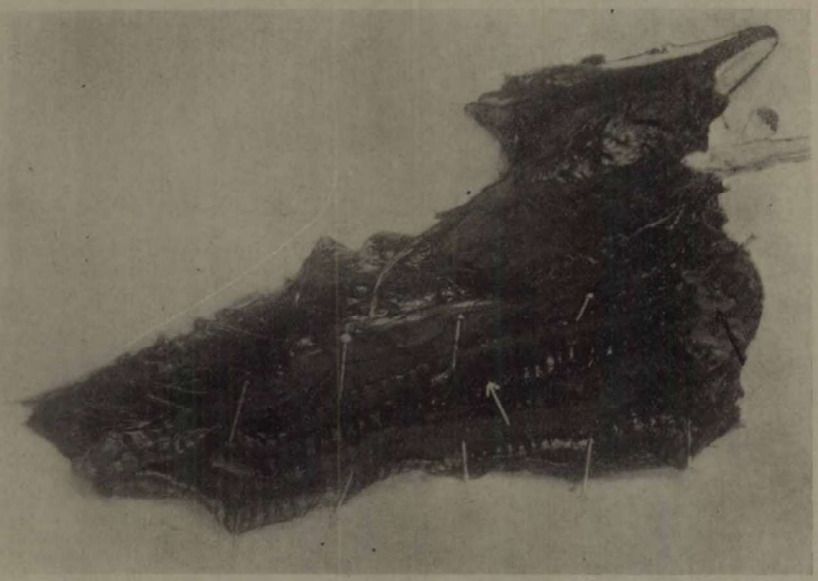

FIG. A3.—Infectious bronchitis; same subject as in figure A1. Upper larynx and trachea (windpipe) laid open and pinned back to expose the infected inner parts. Caseous pus appears in the larynx as a light area, and the darkened areas in the trachea are blood clots.

Heretofore, considerable emphasis had been placed upon a difficult or gasping form of breathing as a diagnostic symptom of the disease in question. Along with other symptoms or pathological changes characteristic of infectious bronchitis, this form of breathing is of some value diagnostically. Alone, however, it merely indicates an oxygen starvation, as shown in the roup case under Figs. A-4 and A-5. The cyanotic or darkened colour of the face and anxious expression during the struggle for breath, in the former photo, rather clearly emphasize this point.

In this individual at autopsy the eyes, nose, throat, trachea and sinuses of the head were quite normal. One lung and the corresponding abdominal air cell were completely filled with caseous pus. The other lung was practically destroyed by a similar condition. Birds suffering as this individual are almost invariably emaciated, in contradistinction to infectious bronchitis cases, are more frequently seen in individuals of more advanced years and it occurs singly in a flock.

Regarding treatment of flocks suffering with infectious bronchitis, with the apparent changing manifestation of the malady, two seemingly important points should be kept in mind. The abundant oxygen supply formerly advocated must still be provided for those outbreaks where difficult breathing is a prominent

FIG. A4.—Pneumonic roup; the gasp on inspiration is a symptom characteristic of oxygen starvation. It is more commonly associated with infectious bronchitis.

FIG. A5.—Pneumonic roup; same subject as in figure A4. As the air is exhaled from the lung the head is lowered, and a temporary but brief rest is obtained from the effort of the gasp as noted above.

symptom. Where this stage quickly passes and the lesions are essentially those of an attack of roup then care of the birds and treatment must be in keeping with that prescribed for the relief of the latter malady.

INTESTINAL PARASITISM OF FOWLS

The relatively large poultry plant with which this laboratory is associated has been used for intensive poultry culture for a great many years with the result of the premises having become heavily seeded with the eggs, spore forms and infestation of the intermediate hosts of the various parasites which infest the intestinal tract of fowls.

An effort was made to control the trouble by what appeared as appropriate means. This included rearranging the location of the permanent houses with double yards, to be alternately used as runs for the adult fowls and to be tilled in order to reduce the general worm and other parasite seeding of the premises.

The brooding paddocks were broken up and tilled with the institution of rotation in brooding and cropping of the premises. Later cement runs were placed before the permanent brooder houses and battery brooders were included in the operations.

Range for the growing stock was provided for at a distance sufficiently removed from the plant and under conditions of rotation as was hoped would be effectual in the prevention of infection, or at most a reduction of the parasites to the point of practicability in the usefulness of the birds.

The plan was based on breaking the life cycle of the parasites thus preventing their propagation. This was more easily accomplished regarding the capillaria and tape worms, but on the whole varying degrees of success followed the effort, particularly with those parasites which are most easily transmitted by human agencies, such as coccidia and hetcrakis (ceca worms).

A number of other plants working co-operatively with the same service brought similar parasitic troubles under complete control but whether this was due to greater thoroughness in carrying out the plan, or was more easily effected by virtue of a lower degree of parasitism on the establishments has not been definitely determined. No small amount of importance should be attached to the need for changing established practices, as these customs were essentially the fundamental factor in bringing about the primary development of the trouble.

The control of a high pullorum disease incidence in this main flock made possible the raising of a much higher percentage of the chicks hatched, and probably had something to do with the imperfect parasitic control. In this respect when pullorum killed off as high as 25 per cent or more of the chicks hatched there would be a smaller number of remaining chicks to occupy the houses than after the mortality was decreased to 5 per cent or less. The more intensive condition resulting, because of its crowded conditions and the larger number of contacts, constitutes a more favourable place for the parasites to find their way from one victim to those in whom they may seek to further propagate their existence. Where many individuals are congregated together the problem of disease control becomes extremely difficult, and for this reason the numbers should not be increased on a badly infested plant until such time as the disease has been brought under complete control.

The one lesson apparently to be learned from the past years effort to have these parasitic diseases brought under control, is the association between brooding operations and the degree of parasitism in the resulting adult stock. That is, there is recorded a direct variation in the incidence of parasitism according to the proximity of brooding operations to the reservoir of infection—the infective poultry plant.

Table A-10 records the degree of parasitism as expressed in terms of mortality during the pullet year, covering a period of seven years and under varying brooding arrangements.

In each instance the stock was ranged, well removed from the plant, and for analysis purposes may be disregarded. This does not necessarily mean that conditions of range do not influence the extent of disease through varying conditions quickening or slowing the transmission of parasites between different fowls, but it is believed that they were not sufficiently dissimilar to materially alter the percentages.

Regarding the brooding itself the greatest incidence occurred when the chicks were brooded on the plant, even though in these instances the land about the colony brooders had been cropped between operations. The opposite to this occurred when the brooding occupied a position sufficiently removed to break the contact, and the degree of freedom depended upon the earliness with which this occurred in the chicks lives after incubation.

In these studies the coccidia and ceca worms proved by far the most difficult of control, and were believed to have been carried by human agencies. Capillaria and several forms of tape worms were present in the adult birds but disappeared from subsequent generations under conditions of control which failed to be effectual against the other parasites.

The parasitism in the pullet year birds occurred previous to the return to the plant as the parasites in each year, when present, were demonstrated in the stock while still on range. The improbability of infestation while on range, and the probability of its occurrence during brooding is most probable, for when brooded and ranged off the plant freedom occurred. In addition thereto in other years the degree of parasitism varied in relation to time spent on the plant while in the brooder.

There is a possibility of additional coccidial parasitism having been added to the infestation of the stock after the birds were housed in the permanent houses in the fall. In this case it would have been by species differing from those with which the stock had previously been infested, which would be independent of the contraction occurring during brooding or range. This matter may be definitely settled in the future since the different species of coccidia have been established and the pathology of each determined.

TABLE–A–10.—INTESTINAL PARASITISM

DEATHS occurring in pullet year flock due to intestinal parasitism. Actual percentages calculated on total bird population. Variation in incidence apparently associated with proximity of brooding operations to the source of infection—the contaminated poultry plant.

Year letter	Breeds			Brooding proximity to poultry plant	Range proximity to plant
	S.C.W. Leghorn	B.P. Rock	Breeds combined		
H	7·35	7·63	7·45	on plant	In each instance the birds were ranged two to several miles removed from the plant. Different position each year.
I	0	0	0	½ mile removed	
J	7·91	2·21	5·31	on plant	
K	6·21	4·00	5·22	(started in permanent brooder and moved to colony brooders 100 yds. removed from plant). (1 batch started as above, remainder brooded 100 yards removed from plant).	
L	4·16	6·25	5·30		
M	0·16	0·81	0·45		
N	7·13	11·70	9·43		

PULLORUM DISEASE

CHICK MORTALITY THEREFROM AND ITS CONTROL THROUGH BLOOD-TESTING OF THE ADULT FOWLS

That blood testing if followed by the elimination of the reactors, and care is taken not to reinfect the stock from outside sources, is beneficial as shown by the results secured upon the Experimental Farm flocks in the greatly reduced chick mortality since testing began.

The work of testing the adult birds for the detection of disease transmissible to their progeny was commenced at one of the Farms in an effort to reduce the appalling chick mortality, after all other attempts at control had failed, and following a positive diagnosis of the presence of a pullorum like disease in the flock. At that time the ascending chick losses had reached a bare fraction less than 75 per cent.

Table A-11 for five Farms gives the viability of the chicks for the year preceding testing, and the subsequent years up to date, with the exception of one flock where testing started in 1923, and immaterial intervening years have been dropped for the sake of brevity. Where the infection was the highest, the results obtained were in each case the greatest as might be expected if the test fulfilled the purpose for which it was intended.

TABLE A-11.—VIABILITY IN CHICKS FROM PULLORUM INFECTED FLOCKS

(First figures on left were previous to testing viability)

Station	1926	1927	1928	1929	1930	Spread between four or more years
	(1923)					
A	25·2	74·6	83·3	77·5	86·0	60·8
B	57·0	97·2	92·2	93·9	91·2	34·2
C	80·5	83·9	88·6	88·6	95·9	15·4
D	.....	80·9	94·6	92·6	92·2	11·3
E	54·8	87·8	94·6	92·0	94·3	39·5

A summary of the results obtained on the Ottawa flock, where the laboratory is maintained, is given in Table A-12. In this case the chick mortality for three years preceding testing is contrasted against the losses following testing. In each instance the test was applied but once annually, to the young stock after it had reached maturity in the fall, and at the same time to all older birds on the plant. It will be observed that there was a lowering of the mortality and the reactors corresponding one with the other.

TABLE A-12.—CHICK MORTALITY BEFORE AND AFTER TESTING

(Central Experimental Farm Flock)

Year	Mortality	Reactors
	%	%
1923	20·6	No tests
1924	33·4 (24·7)	No tests
1925	20·8	21·2
1926	10·8	3·4
1927	9·4	4·6
1928	9·1	1·2
1929	5·0	0
1930	3·79	0

The single tube macroscopical agglutination test was used throughout the various years, and a serum-antigen dilution of 1 in 80 was employed up to and including 1926. The following year the serum dilution was raised to 1-40, being maintained at that during the subsequent years.

There no longer seems room for doubt that the chick mortality when due to pullorum infection may be reduced and eliminated by the removal of infection in the breeding stock by means of the agglutination test. In order to accomplish the desired results, movement of live stock and hatching eggs onto the premises must be controlled in order that reinfection of the stock does not occur.

Any procedure that has given evidence of proven value and may be reasonably expected to continue to prove of such value is deserving of general endorsement and use.

A total of 7,447 blood samples were submitted to the agglutination test.

CO-OPERATION WITH OTHER AGENCIES

HEALTH OF ANIMALS BRANCH

The poultry disease work that is being conducted by the Health of Animals Branch in co-operation with this Division, is producing good results. Dr. C. H. Weaver, who is in charge of the work, is producing valuable material of great assistance to the poultrymen of Canada. It is hoped that in the near future additional pathologists will be available. This will no doubt make it possible to conduct needed investigations that up to the present have not been possible owing to the lack of pathologists and laboratory room.

CHEMICAL DIVISION

Considerable co-operative work has been conducted with the Chemistry Division in the analysis of feeds, tests of digestibility of feeds, etc. The Chemistry Division is always willing to co-operate in experiments that are of interest to the poultry work.

ILLUSTRATION STATIONS

As has been the case for several years, the poultry work at the Illustration Stations is assisted by this Division. Hatching eggs and breeding stock are supplied under certain conditions. The poultry inspectors from time to time visit the operators of the Illustration Stations in company with the Supervisors and meetings are arranged at many of the Stations.

PROVINCIAL DEPARTMENTS

The fullest co-operation with the poultry department of the provincial governments and the colleges is maintained. Assistance is secured from these, and this Division is always willing to assist them. The friendly attitude of all provincial authorities toward this Division is much appreciated and fully reciprocated.

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