UNIVERSITY OF IDAHO
AGRICULTURAL EXPERIMENT STATION
Department of Poultry Husbandry

THE CONTROL OF FOWL POX IN POULTRY

By
E. M. GILDOW, G. S. SCHILLING, PREN MOORE,
AND C. E. LAMPMAN

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THE CONTROL OF FOWL POX IN POULTRY

By
E. M. GILDOW, G. S. SCHILLING, PREN MOORE,
AND
C. E. LAMPMAN*

PREVALENCE OF FOWL POX

Fowl Pox (chicken pox) is extremely prevalent in the older and more congested poultry communities of Idaho. The more recently developed and more isolated communities are in most instances free from the disease. Where the disease has established itself, the poultry industry suffers a considerable loss each year due to its ravages. What then can poultrymen in infected communities do to combat it, and how can its introduction into pox free communities be prevented?

In the older poultry raising communities the presence of fowl pox in commercial flocks has come to be expected each fall. This is due to the fact that once the disease is introduced it tends to remain on the premises, and to recur year after year as long as poultry is kept.

It is evident to those familiar with the disease that birds once infected with fowl pox do not again contract it. Furthermore, birds that become infected during the warm dry summer months show very little discomfort and do not develop a severe form of the disease. Young birds, that is those with little comb and wattle development, suffer less from the infection than do older, more mature birds.

Many practices have been used to insure an early introduction of the disease into the pullet flock in order to protect the birds against an infection during the fall and winter months when it assumes its most severe form. One method of accomplishing this in the past has been the introduction of actively infected birds into the pullet flock early in their growing period. This has resulted in the development of immunity in many of the susceptible birds but has fallen far short of producing the desired result: immunity to fowl pox in 100 per cent of the pullets. Consequently some more efficient method of infection or immunization seems to be necessary.

*E. M. Gildow—Associate Professor of Veterinary Science and Veterinarian, Agricultural Experiment Station.
*G. S. Schilling—Assistant Bacteriologist, Agricultural Experiment Station.
*Pren Moore—Poultry Specialist, Extension Division.
*C. E. Lampman—Professor of Poultry Husbandry and Poultry Husbandman, Agricultural Experiment Station.

CAUSE AND SYMPTOMS

Fowl pox is caused by a filterable virus similar to the virus causing small pox in humans and cow pox in cattle. Fowl pox virus is very resistant to ordinary weather conditions. It can be kept in the laboratory for long periods of time (2 or 3 years) without entirely losing its disease producing properties. Consequently, once this disease has been introduced it is very difficult to eliminate. Every year the young birds come down with the disease either from contact with older birds who have carried over the virus, or from virus that has remained in or about the buildings and equipment. This disease may for convenience be divided into three forms which are commonly known as dry pox, wet pox, and canker. All three of these forms may exist simultaneously in a flock.

DRY POX is the most simple form of the disease caused by the fowl pox virus. The lesions in well developed birds are seen as wart like prominences on the comb, face, or wattle; these are shiny and yellow at first, but develop into blackened scabs as the disease progresses. (See plate 3).

WET POX is the condition in which the disease is complicated with secondary infections of the eyes and nasal passages. As contrasted with dry pox the secretions are moist and the affection may develop into roupy conditions.

CANKER may be caused by other agencies than fowl pox. The form that is seen in fowl pox is caused by the filterable virus of the disease and occurs in the throat and mouth of the bird. These cankers cannot be differentiated in the field from other types of canker that may be caused by other agencies, except by their associations in the flock with pox lesions on the comb, face, or wattle. They are firm, yellow, variable sized, cheesy masses and are closely adherent to the mucous membrane.

With experimental birds the disease usually becomes evident five to seven days after infection and reaches its height at the end of the third week. Where there are no complicating factors one may expect the birds to recover rapidly after this time. When canker or secondary infections such as are found in wet pox are present, the disease is longer in duration and there is less probability of recovery. The disease normally occurs in the late fall or winter months and causes more damage during this season than at any other time. In occasional outbreaks in the early fall when the weather is warm and dry, the detrimental effects are not extensive. The presence of the disease in a flock is associated with a decided drop in food consumption. In laying

birds, egg production drops rapidly and many birds may be thrown into a molt. In ordinary outbreaks the mortality does not usually exceed 2 per cent, though cases where it has run as high as 15 per cent have been observed. Wet pox and canker are the forms most commonly encountered during the late fall and winter months.

METHODS OF INTRODUCTION

The question of the mode of introduction of fowl pox is of vital importance to the poultry community as well as to the individual poultryman, since the disease spreads rapidly in a community once it is introduced into a flock in that community.

Two factors are of major importance in the introduction of this disease into a flock or community. The first covers those practices tending to introduce the disease from distant sources, of which an outstanding example is the general traffic in breeding cockerels. These birds when obtained from a flock where the disease regularly occurs usually carry it to the flock in which they are placed.

If new blood is desired, breeders are advised to purchase hatching eggs or day old chicks from the same source that they would otherwise have purchased cockerels. The purchase of mature or semi-mature birds from an outside source is certainly to be discouraged from the standpoint of disease control.

The use of returnable shipping crates and permitting traveling fowl buyers access to the poultry yards and houses are other methods of its introduction into a community.

The second factor in the introduction of fowl pox is that known as neighborhood transmission. Once the disease has been introduced into a poultry community it spreads more or less rapidly from farm to farm through the agency of insects, wild birds and animals, dogs, cats, and through the visiting of neighboring poultrymen.

It has recently been proven that the mosquito is capable of transmitting fowl pox to birds for 14 days after a meal from an infected individual.[9] Ducey[6] recently traced the spread of fowl pox in a community to the contamination of feed bags on farms where the disease was present and the use of such bags by the local feed mill. One should, therefore, be extremely careful to guard against these methods of introduction.

TREATMENT

Many medicinal remedies are advocated for the treatment of birds that have fowl pox, although none of them is entirely satisfactory.

The use of medicinal agencies is absolutely necessary, however, if one wishes to control the disease once it is established in the flock.

This treatment consists in the use of laxitives in order to keep the digestive tracts of the birds in the best of condition, and in the use of some form of drinking water medication to prevent the spread of the infection through this source.

The use of two per cent of sulphur in the mash mixture has been used quite extensively in order to keep the digestive tract of the birds active. Where a still more active response is desired, one pound of epsom salts dissolved in sufficient drinking water for one day for each 500 pounds of birds may be used.

All feed, both mash and scratch, should be fed in hoppers throughout the duration of the disease. The pens should be cleaned and disinfected frequently. Absolute dryness in the pens is essential in the satisfactory control of fowl pox. Painting the raw areas on the head with tincture of iodine after the scabs have been removed, and the use of some disinfectant such as a 15 per cent solution of argyrol for swabbing the eyes and throat of affected birds, are distinctly advantageous practices.

Badly affected birds should of course be isolated and this treatment together with careful nursing instituted. The fact that the disease occurs in a mild form during the summer months should be taken advantage of by supplying accessory heat as a treatment. If brooder houses can be equipped with a brooder stove and used as isolation houses, it will be found that the birds respond more rapidly to treatment. After the disease has subsided, extreme care should be used in thoroughly cleaning the brooder house before again using it for brooding purposes.

PREVENTION

The prevention of the development of fowl pox in a flock may consist in first, the prevention of its introduction; second, its complete elimination followed by the prevention of reintroduction; or third, by the annual immunization of susceptible birds. The first of these methods has already been referred to in this paper. Since the second method is associated with immunization of susceptible birds it will be discussed following a consideration of the third procedure.

IMMUNIZATION BY VACCINATION

In 1910 the first report of a successful attempt of immunizing fowls with the virus of fowl pox was presented. Since that time various methods have been used to produce immunity to this disease. In the earlier work some form of attenuation or weakening of the virus was used. Recently considerable work has been done with non-attenuated fowl pox virus in producing immunity.

In the fall of 1926, following the report of successful immuniza-

tion of poultry against fowl pox by De Blieck and Van Heelsbergen[1] through the use of the product known as "Antidiphtherin," a successful attempt was made to artificially immunize four months old Single Comb Rhode Island Red pullets to fowl pox.[2] This was accomplished by swabbing a concentrated suspension of fresh moist fowl pox scabs just removed from an infected bird on a scarified area on the leg of each of 44 such pullets.

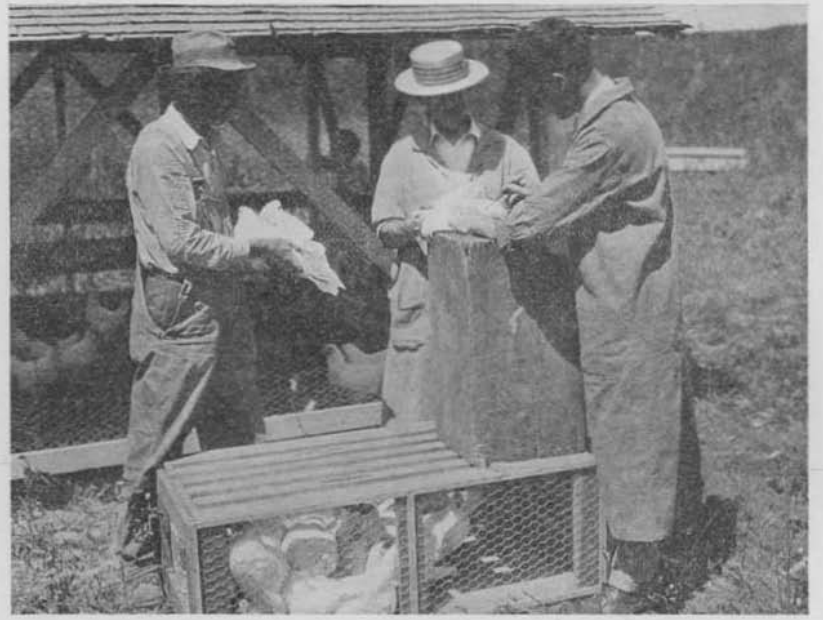

PLATE 1.

Vaccinating 3.5 months old single comb White Leghorn pullets on the range.

Note 1. That birds are held by the wings and legs.
2. That the bird's head does not touch any of the equipment.
3. That only the vaccinator comes in contact with the vaccine.

At the end of ten days a dark scab had developed at the point of vaccination in each case. At this time five vaccinated and six non-vaccinated birds were tested for immunity to fowl pox by scarifying their combs and swabbing the area with a suspension of fresh scabs similar to that used in vaccinating the 44 pullets. These 11 birds were then placed in the house with the originally vaccinated birds.

Three of the non-vaccinated birds developed severe cases of fowl pox. None of the five vaccinated birds developed pox lesions. Although the three badly diseased birds were left in the pen with the

vaccinated birds for two months, none of the forty-four vaccinated birds ever showed evidence of pox lesions.

Following this trial, 1000 pullets on the same farm were vaccinated as they were housed. No evidence of pox appeared in the vaccinated birds during the following winter season though some pox was present before vaccination.

Since this study was started several papers and articles have been presented covering different phases of the problem. Johnson[2] in 1927, Beach[3] in 1927, and Sawyer[4] in 1929, have established the fact that the use of a virus-vaccine (so termed by Johnson[2] as meaning "the use of active, disease-producing virus which is unmodified") has been of decided value in producing immunity to fowl pox. Pyle[5] in 1928 in studying the actual cause of the developed immunity has shown that definite immunity is apparently established through cutaneous lesions.

Following this field trial a program was outlined to determine the most satisfactory age to vaccinate, and if possible, the correct number of feather follicles to use.[6]

EXPERIMENTAL PROCEDURE*

Lots 1, 2, 3, and 4, consisting of 20 Rhode Island Red pullets each, being 2.5, 3.5, 4.5, and 5.5 months of age respectively, were vaccinated on November 23, 1927, with living fowl pox virus vaccine. Each lot was divided into four groups of five birds each in which 3, 6, 9, and 12, feather follicles were used for vaccination.

All of these birds were of similar breeding and were grown in batteries until 2 months of age. Lot 1 suffered considerably from coccidiosis when placed with the pullets of lot 2 at the time of vaccination so did not show a satisfactory gain in weight.

Table 1 gives the gain in weight for the first three weeks following vaccination for each lot and each group. Fair gains are shown by each lot with the exception of lot 1 which suffered from coccidiosis.

The summary for groups A, B, C, and D shows greater gains as the number of follicles used for vaccination decreased. In order to test the persistence of the immunity conferred by vaccination, birds representing each age group as well as the different numbers of follicles infected were tested at approximately 5.5, 10.5 and 17.5 months after vaccination. All birds tested showed complete immunity to fowl pox.

These tests indicate that the birds in the three age groups ranging from 2.5 to 5.5 months and vaccinated in from 3 to 12 follicles were lastingly immunized to fowl pox. The tests show further that the smaller the number of follicles infected, the less severe is the vaccination sickness shown as reflected by gains in body weight.

*This program was carried out by E. M. Gildow while associated with the University of New Hampshire, Durham, New Hampshire.

TABLE I

GAIN IN WEIGHT FOLLOWING VACCINATION

Condensed data on gain in weight in pounds and ounces during the three weeks following vaccination in relation to age of birds and number of follicles infected.

Lot	Age when vaccinated	Group Follicles infected	A 3	B 6	C 9	D 12	Gain in wt. all groups in lot	Head‡ lesions	Remarks
			lbs. & ozs.	lbs. & ozs.	lbs. & ozs.	lbs. & ozs.	lbs. & ozs.		
1	2.5 Mos.		1-10	1-7	0-7	0-5	3-13	4	Two birds didn't take
2	3.5 Mos.		3-13	1-0	3-4	1-10	9-11	1	
3	4.5 Mos.		1-4	2-13	1-9	1-4	6-13	1	
4*	5.5 Mos.		1-5	1-5	0-6	0-11	3-11	1	
Total Gain for Groups			8-0	6-9	5-9	3-14			

*A few birds in Lot 4 started laying during the three weeks following vaccination.

‡The head lesions recorded were in every instance small, consisting of one to three small wart like papules that soon dried up.

FIELD TRIALS IN IDAHO*

The feather follicle method of vaccination was employed on three flocks of Single Comb White Leghorns consisting of: A, 250 pullets; B, 150 pullets; and C, 900 pullets and 100 cockerels. The work was done about the middle of August at which time the birds in flock B were four and one-half months of age, while those in A and C were five months old. Since the course of the vaccination sickness and the subsequent history of the three flocks where similar, the observations on flock C are presented as representative.

Fowl pox had been endemic on the premises for a period of years, and was of that type which flares up with disastrous effect in the early months of winter. The first eggs had been laid the day previous to vaccination, by two pullets and the balance of the flock was approaching sexual maturity.

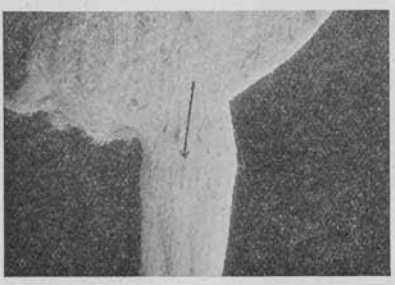

PLATE 2

Showing the bare region on the upper thigh on the margin of which the feathers are removed for vaccination.

Five to seven follicles were inoculated with the virus, and it was the aim to treat follicles of the moist type, for it was known that a dry follicles does not afford a good site for the virus to penetrate.

An examination of a portion of the birds ten days later, showed distinct swellings in the treated follicles in 100 per cent of the birds examined. No symptoms indicating depression

*Contributed by G. S. Schilling, Idaho Experiment Station Report, 1928.

were observed at this time, though a few individuals gave evidence of molting. While there had been a complete cessation in lay after vaccination, at this time a few individuals were laying.

On September 15, one month after vaccination, a partial molt was in evidence as a uniform condition throughout the flock. The egg production on this date was 6 per cent, and was increasing daily. The birds were housed on September 29, six weeks after inoculation, at which time the production was 12 per cent.

From this time forward the gain in production was rapid. The flock was in fifty per cent production by October 20, and had an average production for that month of 42 per cent. The average production for November was 70 per cent, and a high productive level was maintained during the ensuing months.

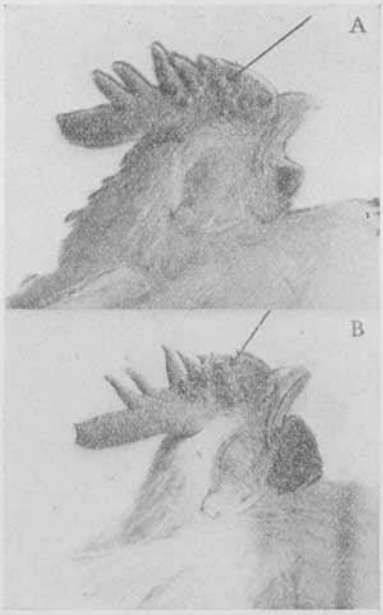

PLATE 3
(a) Yellowish wart-like fowl pox lesions 10 days after infection.
(b) Blackened scabs of fowl pox 22 days after infection. Same bird as (a).

The cockerels which had been vaccinated on the same date, and which were held in a separate yard, showed a course of molting similar to that in the pullets. Except for this symptom there were no other depressant effects attributable to vaccination sickness. There was no diminution at any time in their activity or pugnacity.

Head lesions did not appear on any birds; neither were there any deaths during the active period of the inoculation disease. In fact, the subsequent history of these flocks showed a singular freedom from intercurrent infections during the ensuing months. The only mortality in flock C, for example, was a negligible number of losses due to "blow-outs."

A conservative summation of the results of the vaccination in these three flocks is that it delayed the achievement of their expected productive level by about one month, but gave complete protection to the invasion of fowl pox.

A further favorable effect may probably be found in the fact

that these flocks did not experience roup, colds, and similar respiratory troubles. These diseases frequently appear simultaneously or following a natural outbreak as complications because of the lowered resistance of the birds due to the infection with the pox virus.

OTHER FIELD TRIALS

Further information has been obtained on the value of this method of vaccination through its practical application in field trials.[7] Table II gives the condensed data on fifteen such vaccinated flocks representing 17,283 birds. It can readily be seen from an examination of the data that uniform results cannot be expected from this type of vaccination under varied conditions.

Such factors as the breed, condition, age, sexual development of the birds, the season of the year, and the presence or absence of other disease conditions in the flock are factors in determining the practical success of vaccination.

A distinct drop in food consumption is generally seen following the vaccination of susceptible birds. If such birds are in production, a distinct drop in egg yield is observed. Very little mortality attributable to the vaccination was detected in the birds included in these trials.

Flocks 2 and 11 show but 20 per cent "takes" at vaccination. Pox had been in these flocks in previous years and was present on the range to some extent before the birds were vaccinated. This may account for the low per cent of "takes" in these flocks.

Fowl pox was present in flock 3 before vaccination and about 25 per cent of the birds already showed head lesions. Very few head lesions developed after vaccination.

The low percentage (75) of "takes" to vaccination and the high percentage of head lesions shown in flock 6 was due largely to the irregular reactions shown by 400 Barred Rock pullets obtained from flock 2 before vaccination.

The high percentages of head lesions shown in flocks 9, 14, and 15 were due to the presence of the disease in these flocks prior to vaccination.

VACCINATION PROCEDURE

All birds to be vaccinated must be shut in or closely confined the evening before. It is important that every bird in the particular unit be included since birds that are not vaccinated will probably contract the disease in its natural form.

The vaccinator should assume a comfortable position standing or sitting so that the birds will be presented at the most convenient point. A small box or barrel on end should be placed before the vaccinator on which to place the bird.

TABLE II

CONDENSED DATA ON 17,283 BIRDS VACCINATED IN THE FIELD

Flock No.	Vaccinated or Controls	Month Vaccinated	Breeds	Age At Vaccination	No. Follicles Used	No. Birds	% Vaccination Took	% Head Lesions		Food Consumption	Mortality due to Pox	Production if Laying	
								After Vaccination	Later			After Vaccination	Later
1	Vaccinated	June July	Several	4-5	6	1350	100	0	0	Drop	0	Distinct Drop	Normal
	Controls	Aug.	Breeds	Months		450		45	9	Normal	0	No Drop	Normal
2	Vaccinated	Sept. and Oct.	Barred Rocks	6 & 7 Months	4	2500	20	10	0	Slight Drop	0	Slight Drop	55%
	Controls		"	"		500		10	½	Normal	0	No Drop	55%
3	Vaccinated	Oct. 17	R. I. Reds	5 & 7 Months	3	625	100	27	0	Distinct Drop	1%	50%	Normal
	Controls		"	"		27		80	0	Distinct Drop	7%	50%	Normal
10	Vaccinated	Oct. 25	R. I. Reds	Hens & Pullets	4	876	100	0	0	Distinct Drop	½%	45% to 35%	Normal
	Controls		"	"		99		12	0	Distinct Drop	6%	45% to 22%	Normal
4	Vaccinated	June & July	R. I. Reds	3 to 5 Months	4	1005	100	0	0	Slight Drop	0	Not Laying	Normal
5	Vaccinated	Sept.	White Legs.	4 to 6 Months	4	2000	100	1	Few	Dropped ⅓	3%	Dropped ¼	Excellent
6	Vaccinated	Aug. & Sept.	Sever. Breeds	5 & 6 Mo.-Hens	6	1318	75	15	5	Not Recorded	½%	Not Laying	60%
8	Vaccinated	Aug.	Barred Rocks	2 to 5 Mo.-Hens	5	760	100	1	0	No Record	½%	Hens Molted	Normal
7	Vaccinated	Aug.	White Legs.	5-6 Months	4	1000	100	0	0	Distinct Drop	0	Distinct Drop	Normal
9	Vaccinated	July	Buff Orps.	4 & 5 Mo.-Hens	5	285	100	8	0	Normal	0	Normal	Normal
11	Vaccinated	Nov. 5	R. I. Reds	7 Months	4	800	20	5	0	No Drop	0	No Drop	Normal
12	Vaccinated	Nov. 5	R. I. Reds	6-9-18 Months	4	1125	98	0	0	No Drop	0	Increased	Normal
13	Vaccinated	Dec. 13	R. I. Reds	6-10-18 Months	4	940	97	0	0	Slight Drop	0	35% to 15%	Normal
14	Vaccinated	Dec. 15	R. I. Reds	9-10 Months	4	480	75	10	0	Slight Drop	2%	32% to 25%	Normal
15	Vaccinated	Mar. 2	R. I. Reds	Pullets & Hens	3	900		10	0	Slight Drop	½%	26% to 23%	Normal

*Data on flocks 11, 12, 13, 14, 15 was obtained from Dr. C. A. Bottorff, University of New Hampshire.

One or two assistants should present the birds for vaccination holding them by the wings and legs on the right side with the breast toward the vaccinator. *The bird's head should protrude over the edge of the platform* so that it will not come in contact with any of the equipment (See plate 1).

The vaccinator is the only one who comes in contact with the vaccine. He spreads the feathers back on the middle of the tibial or lower leg region in the vicinity of a spot free from feathers (See plate 2). From three to six feathers, depending on the plumpness of the follicles, are plucked adjacent to this bare spot. The vaccine is introduced into the follicles, left open by pulling the feathers, with a camels hair brush that has been dipped in the prepared vaccine. For convenience and to prevent the possibility of spilling, the vaccine is best held in a small shallow receptacle. (See Plate 4). A vaccinator with two assistants can easily vaccinate 200 birds an hour and it is not uncommon to do 400 an hour.

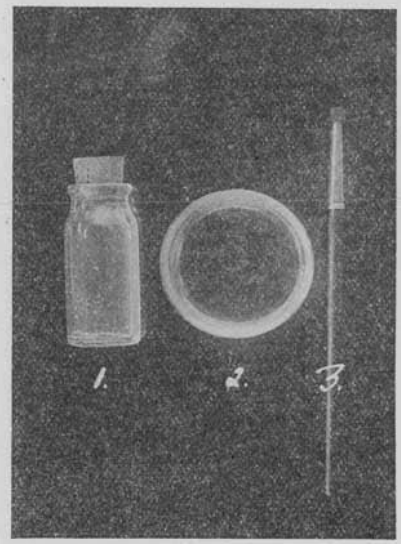

PLATE 4.

1. Vaccine.
2. Shallow plate for vaccine.
3. Clipped camels hair bruch used in applying vaccine.

One should be able to vaccinate 500 birds with 20cc. of the prepared vaccine where the virus suspension is thin. Commercial vaccine will be labeled in regard to the number of birds that should be done with a given amount of material.

CARE DURING VACCINATION

Extreme care must be taken in the method of handling birds for vaccination when head lesions are already present. In a preliminary trial on two farms in December, 1927, where the infection was present to the extent of about 5 per cent, the error of holding birds for vaccination with the head touching any part of the equipment or apparel of the persons assisting was demonstrated. In these instances the heads of the birds were placed under the arm of the assistant who held the bird for vaccination. In this way the under arm became contaminated with virus from the heads of infected birds and transmitted it to the succeeding

birds. Ninety per cent of 600 birds on one of these farms showed head lesions following vaccination.

THE VACCINATION LESION AND AFTER TREATMENT

It is desirable to examine a portion of each lot of birds vaccinated about ten days afterward in order to be sure that the vaccination took. This can be determined by an examination of the follicles vaccinated. These can be located by their proximity to the area devoid of feathers on the lateral region of the leg. If the follicles are swollen and are capped with a black scab (See plate 5) it indicates a take. When the vaccination does not take an effort should be made to determine the reason for the failure. The reason may be that the birds have previously had the disease and are immune; that the vaccine was not properly applied; or that the vaccine was not potent.

After treatment is essentially the same as for the management of a flock naturally infected. It consists in keeping the bowels in a laxative condition by the use of green succulent feed, and if necessary, by the use of sulphur in the mash feed or Epsom salts. Birds that develop head lesions should be isolated and treated as though they had a natural infection.

FLOCKS AND BIRDS TO VACCINATE

It is folly to introduce the disease into a clean flock by vaccination when the disease is not already present and where it in all probability will not establish itself, for the disease once introduced usually recurs year after year. Flocks that are infected with the disease or are in a neighborhood where the disease is prevalent should be vaccinated. Only birds that are not infected and have not had the disease should be vaccinated. Birds in poor condition due to any cause should be culled.

PLATE 5.
Arrow points to blackened scabs in follicles 10 days after vaccination on Rhode Island Red cockerel.

In general all susceptible birds on the farm, both pullets and cockerels, should be vaccinated within a reasonably short period. However, if the birds can be kept separated, late

birds may be allowed to develop somewhat after the early pullets are vaccinated, before vaccinating them.

SEASON AND AGE TO VACCINATE

If possible vaccination should be done during the warm dry summer months when the disease in natural outbreaks is least severe. Birds may be vaccinated any time after they are two months of age. The most satisfactory time is after the broiler cockerels have been removed and the pullets have been culled. It certainly should be done before comb and wattle development has progressed extensively; that is, before the pullets begin to attain sexual maturity.

LATE FALL OR WINTER VACCINATION

An examination of the data presented will show that one advantage of late fall or winter vaccination, where the disease breaks out in a flock for the first time, is that it largely prevents the further development of head lesions. Head lesions usually become complicated with roup at that season of the year. A second possible advantage is that it speeds up the development of immunity and consequently results in an earlier recovery. Further, it gives the birds more time to get back into condition before the hatching season.

SOURCE OF VACCINE

Fowl pox vaccine of this type variously known as "Red-Hot virus vaccine", "non-attenuated fowl pox virus vaccine", and "an active disease-producing virus which is unmodified", is being produced by several commercial laboratories and is available to veterinarians and poultrymen. The local veterinarian, the College of Agriculture of the University, or the State Bureau of Animal Industry will be able to give you further information in this respect. Cutaneous vaccine is that designated for use on the skin, that is, follicle vaccination; while subcutaneous vaccine is that designated for injection under the skin with a hypodermic needle. Either of them will be satisfactory providing the virus used in their preparation is non-attenuated.

ELIMINATION OF THE DISEASE

It has previously been stated that the virus of fowl pox is very resistant and will therefore in most instances live over from year to year on those premises where the disease is allowed to run its natural course. The problem of elimination is therefore a difficult one. It is made even more difficult and uncertain if the flock is located in a poultry community where pox is annually present.

It is possible to eliminate the disease in a flock that is fairly well isolated, and there is a decided advantage in completely eradicating the

disease in all cases where there is a possibility that its re-introduction can be prevented. Several cases in which an elimination program was carried out are reported here.

One poultryman who became overburdened with poultry diseases, including fowl pox which had been introduced by the purchase of breeding males from infected flocks, sold his entire flock of 3000 Rhode Island Reds in the fall of the year. He thoroughly cleaned his poultry equipment and secured clean pox-free pullets the following spring. Two flocks of pullets have now been produced without any evidence of pox being present.

A Single Comb White Leghorn owner who introduced pox into his flock of 1000 birds by the purchase of breeding cockerels in the early winter, grew his entire pullet flock on another portion of the farm in an attempt to eliminate the disease. The old hens were sold early in the spring; this permitted him to thoroughly clean up his laying house and equipment in the two month interval before housing the pullets. He did not experience any pox during the following year in the housed pullets.

On two additional Rhode Island Red poultry farms where the disease was introduced in the early fall by purchased breeding males, the disease was eliminated by vaccinating every bird on the farm and by following this with a thorough cleaning of the equipment as soon as the outbreak had subsided. No evidence of pox has been detected since on either of these farms.

Instances are on record where the disease has died out of its own accord. This is more apt to occur in an isolated flock where the disease has appeared in an acute form early in the fall season. All birds must have contracted the disease to insure a general flock immunity so that no method of propagation of the virus is present during the remainder of the year. This is essentially what happens when the disease disappears without further attention following the complete vaccination of an isolated flock early in the fall.

NATURAL INFECTION

Birds of any age that have not been previously infected are susceptible to fowl pox. Aged birds and mature pullets in the same flock may show the same degree of infection. However, immature birds do not generally show as high a percentage of nor as severe an infection as mature birds in the same flock. Young birds may contract the disease any time after they are hatched.

An interesting example of early infection occurred in a group of White Wyandotte chicks. On June 15, 1927, a group of White Wyandotte chicks ranging from two weeks to two months of age was

presented in the laboratory for examination. These chicks were all found to be suffering from fowl pox.

The two month-old chicks showed lesions on the face and wattles and particularly at the corners of the mouth. Some of the chicks were poorly feathered. These showed lesions around the vent. The two weeks old chicks had been toe-punched at hatching time and every toe-punched area showed fowl pox scab development. These two weeks old chicks also occasionally showed lesions at the corners of the mouth.

The cause for these chicks showing a natural infection with fowl pox so early in life was due to the fact that they were brooded under White Wyandotte hens that had the disease at the time. It appears that the infection took place most easily where the skin was broken at the toe-punched areas, which conforms with Johnson's[2] statement that the disease does not take on the unbroken skin.

SUSCEPTIBILITY

The question of breed or strain resistance to fowl pox is suggested as a possible reason for the low percentage (20) of lesions following vaccination in flock 2, Table II. A similar occurrence of such a condition was detected in the winter of 1927 in a flock consisting of 150 White Wyandotte and 200 Rhode Island Red pullets of approximately the same age. Pox had never been detected on this farm before and no old hens were held over.

The pullets were ranging together on the same ground at the time pox developed in one Rhode Island Red cockerel. Soon after this the birds were housed in separate houses, the Reds being segregated from the Wyandottes. One pen of 130 Reds showing about 5 per cent head lesions and one pen of 75 Wyandottes showing 10 per cent head lesions were vaccinated. Two weeks later an examination of the Wyandottes showed a lesion at the point of vaccination in every instance and practically 100 per cent of them showed head lesions of a severe form, while but 50 per cent of the Reds showed lesions at the point of vaccination and but 8 per cent had head lesions and these were of a minor nature. These findings are evidence of a degree of resistance in the Reds over the Wyandottes.

In order to check up on the possibility of an hereditary resistance to pox in these Red birds as compared with the Wyandottes, chicks were produced from hatching eggs obtained from the stock from which these birds came. At the age of 16 weeks 10 Reds and 14 Wyandottes from these strains were vaccinated on the leg with a virulent fowl pox vaccine. One hundred per cent of the birds in both lots showed lesions of about the same intensity at the point of vaccination two

weeks later. This did not reveal any hereditary difference in the two strains though it seems likely that such a condition actually exists in poultry.

SUMMARY

1. Fowls may be successfully immunized in the field by the feather-follicle method of vaccination.
2. Fowl pox is the only disease to which immunity is developed by this vaccination.
3. Vaccination in three follicles seems most satisfactory.
4. Birds should be vaccinated after they have been culled and the broiler cockerels removed and before there is any extensive comb development.
5. Birds suffer less from vaccination sickness if the vaccination is done during the summer season.
6. All susceptible birds on the farm should be vaccinated within a reasonably short time, unless adequate means of quarantine are at hand.
7. Care must be exercised in handling birds at vaccination to prevent their heads from becoming contaminated with the virus.
8. Only flocks that are already infected or are in a neighborhood where the disease is prevalent should be vaccinated.
9. Flocks that become infected for the first time in the late fall or winter may be vaccinated to some advantage.
10. Vaccine of this type may be obtained from commercial houses.
11. Treatment of vaccination sickness should be similar to that practiced during a natural outbreak of fowl pox.
12. Barred Rock hens that had not molted prior to being vaccinated after the last of August were thrown into a molt. (Flock 8).
13. Six months old Leghorn pullets vaccinated after August dropped off one-fourth in egg production. (Flock 5).
14. Six to ten months old Red pullets vaccinated after November 24, dropped from 39 to 25 per cent production. (Flocks 10-13-14).

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