

STUDIES ON AN UNCOMPLICATED CORYZA OF THE
DOMESTIC FOWL

V. A CORYZA OF SLOW ONSET

By JOHN B. NELSON, Ph.D.

(From the Department of Animal and Plant Pathology of The Rockefeller Institute
for Medical Research, Princeton, N. J.)

(Received for publication, January 2, 1936)

The type of fowl coryza with which the bacterium *Hemophilus gallinarum* is associated has, in our experience, been characterized by a uniformly short incubation period. In normal birds which are confined indoors the interval between the injection of either exudate or the specific bacillus in pure culture and the appearance of a nasal discharge has rarely been longer than 2 days. In sharp contrast to the rapid onset of this type of coryza is the delayed incubation period of another infectious coryza which has been encountered from time to time in birds injected with nasal exudate from naturally infected fowl. Earlier observations on this coryza, in 1932, had suggested that its characteristics were not stable since the continued passage of exudate in normal fowl had been followed by reversion to the coryza of rapid onset.¹ Additional strains of the second type were not immediately available and further investigation was not begun until the fall of 1933 when an attempt was made to determine whether or not the coryza of slow onset was a distinct entity or a variant of the coryza of rapid onset.

Serial Passage of the Coryzas of Rapid and Slow Onset

Recently isolated strains of the coryzas of rapid and slow onset were carried simultaneously through a long series of passages in normal fowl as a test of the stability of their respective characteristics. A rigid quarantine of the infected birds was observed as a precaution against accidental cross infection or the introduction of infection from outside

¹ Nelson, J. B., *J. Exp. Med.*, 1933, **58**, 297.

sources. The experimental birds were drawn from a flock of Rhode Island Red fowl reared and maintained at The Rockefeller Institute in Princeton. No natural cases of upper respiratory tract disease have ever been noted in this stock which has been under observation for many generations.

In November, 1933, exudate removed from the nasal passages of several naturally infected birds from a nearby poultry farm was injected into normal fowl and found to produce a coryza of slow onset. The disease was subsequently maintained by serial passage, at intervals which varied from 2 to 5 weeks after the appearance of a nasal discharge. Exudate obtained from the anterior nares

TABLE I
The Incubation Period of the Coryza of Rapid Onset

No. of birds	No. of passages	Date of first passage	Date of last passage	Incubation period		
				24 hrs.	48 hrs.	72 hrs.
54	40	Sept. 13, 1933	July 10, 1935	35	18	1

TABLE II
The Incubation Period of the Coryza of Slow Onset

No. of birds	No. of passages	Date of first passage	Date of last passage	Incubation period in days				
				9-11	12-14	15-17	18-20	21-31
72	20	Nov. 18, 1933	July 9, 1935	8	31	14	6	13

during life or from the interior nasal passages at autopsy was well mixed with sterile nutrient bouillon and approximately 0.5 cc. introduced into the palatine cleft of one or more susceptible fowl. A capillary pipette with an attached rubber hose was used in making the injections.

A strain of the coryza of rapid onset obtained in September of the same year from another local farm was maintained in much the same way. During the first year of observation exudate from the birds in this group was being used for other experiments. For this reason the number of passages was greater than with the coryza of slow onset although fewer birds were actually employed.

Following the injection of exudate the birds were observed daily until a nasal discharge appeared. As already noted, the infected birds which were usually 2-3 months old when injected were held under strict quarantine in separate units to which only the writer and his assistant had access. The birds were generally housed in individual cages, but in some cases 2 birds were kept in a single cage.

Data on the duration of the respective incubation periods of the two types of coryza are summarized in Tables I and II. 40 passages

of the coryza of rapid onset were made between September, 1933, and July, 1935. 54 birds are included in this series of passages. The interval between the injection of exudate and the appearance of a nasal discharge was 1 day in 35 cases (65 per cent), 2 days in 18 (33 per cent), and 3 days in a single case (1.0 per cent). 20 passages of the coryza of slow onset were made in 72 birds between November, 1933, and July, 1935. The incubation periods were 9 to 11 days in 8 cases (11 per cent), 12 to 14 days in 31 (43 per cent), 15 to 17 days in 14 (19 per cent), 18 to 20 days in 6 (8 per cent), and over 20 days, up to 31 as a maximum, in 13 (18 per cent).

Duration of the Coryzas of Rapid and Slow Onset

Birds infected with local strains of the coryza of rapid onset have generally shown a nasal discharge for 2 months and often longer. Infection with one strain, however, caused a coryza which in 20 fowl averaged only 11 days in duration (1). It should be noted that infection with these strains was established by the injection of exudate.

The duration of the nasal discharge in birds infected with the earlier strains of the coryza of slow onset was also prolonged. Observations on the birds infected with the present strain are in accord with this finding. The majority of the infected birds were brought to autopsy early in the disease. 12, however, were kept under observation for a month after the appearance of a discharge and 8 until the discharge had subsided. Of the former, all showed a continuous discharge until killed. Of the latter, the duration of the coryza was 8 weeks in 3 cases, 10 to 12 weeks in 3 cases, and 20 weeks in 2 cases.

Prolonged Manifestations of the Coryzas of Rapid and Slow Onset

The pathological features of the two coryzas are nearly identical. The only observed difference between them concerns the nature of the exudate which is poured forth in the nasal passages. This difference is not a constant finding, however, and has little diagnostic value.

In both cases the chief symptom of the disease is a nasal discharge and the characteristic postmortem finding the presence of exudate in the nasal passages and somewhat less regularly in the adjoining orbital sinuses. Early in the disease the exudate which partially fills the nasal passages of birds infected with the coryza of rapid onset is consistently mucopurulent. Microscopically it shows numerous polynuclear leucocytes with relatively few epithelial and mononuclear cells. The

exudate which the coryza of slow onset calls forth may also be mucopurulent but not uncommonly it is more catarrhal in nature: of a definitely heavier consistency, less readily drawn up with a pipette, and richer in cells—which are predominantly tissue cells. Polynuclear leucocytes may always be found but are usually scarce. Both types of coryza may exceptionally be accompanied by conjunctivitis and tracheitis. The rarity of these manifestations, it may be noted, has characterized all of the strains of both types which have been obtained locally.

Bacteriological Findings with the Coryzas of Rapid and Slow Onset

Cultures were made at irregular intervals from the nasal exudate of birds infected with the coryza of rapid onset. The nasal exudate was streaked on the surface of a horse blood agar plate which was sealed prior to incubation. Colonies of the fowl coryza bacillus, *Hemophilus gallinarum*, were always obtained. If the exudate was cultured during the first few days after the appearance of a nasal discharge, a nearly pure growth of the specific bacillus was generally secured. Cultures made late in the disease showed, in addition, numerous colonies of miscellaneous bacteria. The cultures obtained from these birds were in no way different from the earlier described strains of the fowl coryza bacillus. Like the earlier strains, they all failed to colonize on unsealed blood agar plates and injected intranasally in susceptible fowl they all produced a coryza of short duration.

Cultures were also made from the nasal tract of 50 birds infected with the coryza of slow onset, using both open and sealed blood agar plates. In most cases the exudate was removed for cultivation during the first week after the appearance of a nasal discharge. The plates generally showed miscellaneous colonies, in varying numbers, characteristic of the normal bacterial flora of the upper air passages. Occasionally no growth was obtained on either plate. The conspicuous finding, however, was the complete absence of colonies of the fowl coryza bacillus on the sealed plates. Although most of the cultures were made at a particularly favorable time for the detection of that organism it was not obtained in a single instance.

DISCUSSION

The distinguishing features of the coryza of slow onset appear to be sufficiently stable and distinctive to justify separating it from the coryza of rapid onset. The incubation periods of the two coryzas, although subject to some variation, have never overlapped during the

period that they have been under observation. The interval preceding the appearance of a nasal discharge has not exceeded 3 days in birds infected with the coryza of rapid onset and has not been less than 9 days in birds infected with the coryza of slow onset. There is, of course, no reason to believe that the actual time limits which have obtained with this particular stock of birds would be duplicated in some other genetically different stock.

Substantial support for the separation of the two coryzas is afforded by the bacteriological findings with respect to the fowl coryza bacillus. This organism was readily and regularly isolated from the nasal exudate of birds infected with the coryza of rapid onset but was never obtained from birds infected with the coryza of slow onset. In the case of the earlier studied strains of the latter type attempts to isolate the fowl coryza bacillus had also failed as long as the infected birds showed a long incubation period. These earlier strains, however, finally changed to a coryza of rapid onset and this change was accompanied by the appearance of *Hemophilus gallinarum* in the nasal discharge. In the light of the present observations, it seems probable that this change was accidental and not a true reversion. The change may have been referable to a latent infection with the specific bacillus or more probably to the chance carriage of infection from one group of birds to the other. It can be said with certainty, however, that it was not due to the presence of bacterial carriers in the normal stock of birds.

SUMMARY

A strain of fowl coryza of slow onset was carried through 20 successive passages in susceptible birds over a period of approximately 19 months. During this period it retained its initial characteristics as did also a coryza of rapid onset which was similarly maintained. 88 per cent of 72 birds infected with the coryza of slow onset showed a nasal discharge after an incubation period of 12 days or more; the actual limits being 9 to 31 days. 98 per cent of 54 birds infected with the coryza of rapid onset showed a nasal discharge on the 1st or 2nd day after injection. The duration of both coryzas was prolonged.

Bacteriological examination indicated that *Hemophilus gallinarum* which is invariably present in the nasal exudate of birds infected with the coryza of rapid onset is not associated with the coryza of slow onset.