Psittacosis

BY K. F. MEYER

PSITTACOSIS, a virus disease spread by birds of the parrot family, causes an insidious ailment in human beings that is often hard to distinguish from influenza or pneumonia. Various restrictive measures against birds of the parrot family have been applied in this country in an effort to reduce or wipe out the disease. Recent research discloses the startling fact that the virus may be harbored by other birds, entirely unrelated to parrots—including pigeons and chickens.

It is generally believed that psittacosis is primarily a disease of parrots, parakeets, or other birds of the parrot family (psittacine birds) which occasionally spread their infection to other cage birds, such as canaries and finches. That these avian maladies may cause serious pneumonias, not typical of ordinary pneumonia, in human beings is well known. It was recognized in 1931 that the breeding establishments and aviaries for the raising of parakeets (Melopsittacus undulatus (Shaw)) in California harbored apparently healthy birds that were spreading the disease through their droppings. In fact, it was soon realized not only that imported psittacine birds from South America and Australia may be dangerous pets but that the local breeders in the West and in Florida, Texas, and even Canada are the disseminators of sickness.

Until a few months ago, however, it was not suspected that barnyards and pigeon lofts may be sheltering bearers of disease and even death. The unexpected discovery that the disease can exist in such places puts psittacosis in the ranks of diseases of interest and importance to the poultry farmer. Although the available facts are as

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yet meager, they clearly indicate the magnitude of the problem and
the complexity of the control measures that may ultimately be re-
quired to prevent serious losses and to protect man from this
menace.

With the discovery by Haagen and Mauer that psittacosis affects
the Arctic fulmar (Fulmarus glacialis glacialis L.), or petrel, on the
Faroe Islands and the proved susceptibility of the domestic fowl to the
germ, it was anticipated that sooner or later infections of other avi
species might be encountered. This has happened; but before the
observations are recorded it may be advisable to outline briefly the
facts about psittacosis known by the end of 1940.

THE HUMAN DISEASE

The term “psittacosis,” from the Greek word for parrot, was sug-
ggested in 1895 by Morange to designate a peculiar contagious dis-
ease of man which had been noted among members of households
exposed to sick birds from foreign countries, primarily parrots. In
view of the later findings, described in this article, that the disease
is more widespread among birds than was at first realized, the name
“ornithosis” might be a suitable designation.

The malady became known through localized outbreaks of severe
pneumonia in Switzerland in 1879 and in Paris in 1892. These
epidemics stopped after a series of orders prohibiting importations
of parrots had been issued. Occasionally single or group infections
were reported from England and the United States, but generally
the disease ranked as a medical curiosity. From being a rare and
obscure infection, psittacosis became a malady of world-wide interest
in 1929–30, when shipments of sick parrots imported from South
America into Europe and the United States caused disease in 750
to 800 human beings. The subsequent endemic distribution of
psittacosis of parrakeets in the United States, Canada, and Germany,
which was responsible for an additional 600 recorded human cases,
has offered an opportunity to many investigators for a thorough study
of the avian as well as the human disease, from the standpoint of
its cause as well as its epidemic spread.

It is now firmly established that psittacosis is an infection caused
by a filtrable bacterium, known as Microbacterium multiforme psit-
tacosis, consisting of a protoplasmic cell which can be microscopically
demonstrated and cultivated. The hypothesis originally advanced by
Nocard that the disease is a Salmonella infection has been entirely
abandoned.

Household outbreaks follow a typical pattern. An unusual type
of pneumonia suddenly develops in a member of a family into which
a parrot or a pair of parrakeets, more rarely canaries or finches,
have recently been introduced as cage pets. In rapid succession,
additional cases occur among the relatives and even guests or visitors.
The responsible birds may or may not be visibly sick. Usually

\[\text{HAAGEN, E., and MAUER, G. ÜBER EINE AUF DEN MENSCHEN ÜBERTRAGBARE VIRUS KRANKHEIT DER STURMVÖGELN UND IHRE BEREIHNING ZUR PSITTAKOSE. Zentral. f. Bakt.}
\[\text{[etc.].} \text{ Originalie (1) 143: 81–83. 1938.}
people of middle age are quite susceptible, whereas children rarely contract the malady.

Human beings suffering from psittacosis or ornithosis complain suddenly of general malaise, chills, headache, restlessness, insomnia, nosebleed, and a nonproductive cough (without phlegm). The temperature rises rapidly and after a period of continued elevation begins to fall during the second week. As a rule the signs of a peculiar pneumonia appear early in the X-ray picture but it is difficult to distinguish the changes in the lung tissues from those observed in typical influenza. Despite the inflammation in the lung the breathing rate is only slightly increased, usually no chest pain is noted, and the number of white blood corpuscles does not increase as in typical pneumonia. The patient is unable to raise much sputum. Since these signs are not distinct enough for diagnosis, an examination of the sputum and a blood test are the diagnostic aids commonly used. Convalescence is slow and tedious. The mortality rate, given as 20 percent, is probably too high, since mild, unreported cases are undoubtedly frequent. The younger the individual the greater is the likelihood that the infection will be mild and atypical—like grippe. There is no specific treatment, though serum from recovered patients may reduce the mortality rate.

Occupational liability among persons engaged in the breeding and trading of psittacine birds is high. Laboratory workers, physicians, and sanitary inspectors also frequently contract the disease during the execution of their professional duties. Furthermore, it is important to emphasize that the sputum of patients is sometimes highly infectious, and thus transmission from one human being to another is by no means infrequent.

The infection may be passed from bird to man in one of two ways: (1) Inhalation of dust contaminated with infective particles from dried fecal droppings, urine, feathers, etc., and droplets from the nasal secretions of sick or healthy birds, or (2) by direct contact through bites, though this is rare. The high infectivity of the psittacosis virus, which resembles that of smallpox or measles, is reflected in the histories in which fleeting exposure occurred in a pet shop where diseased birds had been kept. Since air currents may disseminate the virus, actual contact with diseased psittacine birds is not necessary.

Without any definite history of exposure to tropical birds or parakeets, it is difficult to differentiate psittacosis from influenza or some of the virus pneumonias without laboratory aid. The sputum, if it is raised by the patient in sufficient amounts, may be tested by injecting a suspension of the excretion into the peritoneum, or lining of the abdominal cavity, of white mice. These rodents are extremely susceptible to psittacosis and usually succumb to the infection in 5 to 14 days. In recent years the blood test (complement-fixation test) with specially prepared reagents has proved of great value in the early diagnosis of human infections; moreover, it is useful in discovering the existence of psittacosis in aviaries.
THE DISEASE IN TROPICAL BIRDS AND FINCHES

The recognition that avian psittacosis of undetermined origin but as a natural disease is common among the cockatoos, lorikeets, cockateels, and rosellas of the Australian bush, probably serving as a population regulator, and the discovery that shell parrakeets bred and raised in the United States, Canada, and Europe and parrots from Panama and Mexico may act as sources of infection are important contributions resulting from the researches conducted since 1931. Particularly far reaching, however, is the finding that apparently healthy birds may harbor the virus and disseminate it. The incidence of these unrecognized latent infections in aviaries and breeding establishments may range from 10 to 90 percent.

With the aid of the so-called mouse-inoculation test or the blood-serum test, it is now practical to detect these carriers. The suspected large birds are bled from the wing vein; the smaller birds are killed, portions of the liver, spleen, and kidneys carefully ground up, and suspensions of the organs inoculated into white mice or Java rice-birds. When the psittacosis virus is present in the tissues of the suspected birds, the experimental animals acquire the infection and frequently die, providing significant autopsy and microscopic findings. It is important to remember that the clinical manifestations of psittacosis in parrots, parrakeets, canaries, or finches are by no means characteristic, and without laboratory tests the identity of the illness cannot be determined.

In many of the importations, the mortality among the parrots has been very high, whereas in the breeding establishments housing parrakeets under fairly sanitary conditions rarely more than 5 to 10 percent succumb to acute psittacosis. It is well known, however, that many of the pen mates of sick birds carry the infective agent, and, when brought under adverse environmental conditions, such as crowding, malnutrition, and lack of sunlight, these chronically infected birds may suffer relapses. At autopsy, emaciation, an enlarged saffron-colored liver studded with wedge-shaped pale areas of destroyed tissue (infarcts), and a spleen tumor are usually observed. Preparations made from the tissues reveal colonies and clusters of the elementary bodies in large numbers.

Young birds are more susceptible than older ones; the young ones contract the infection in the nests, and whether they are visibly sick or not they may spread the infection for many months and thus maintain the disease indefinitely in breeding establishments or pet shops. The virus-carrying excreta may soil the food and water; hence it is not surprising that contaminated birdseed from pet shops may occasionally cause new infections in cage birds not directly exposed to diseased parrakeets or parrots.

Public health officials are principally concerned with the elimination of infected psittacine birds from the retail trade in pet shops. Some degree of protection has been obtained by such restrictive measures as an embargo on imported birds, quarantines for not less
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than 6 months, and isolation. The recent outbreaks of psittacosis in zoological gardens, however, amply attest to the inadequacy of these precautionary measures. Certain States, including Connecticut, New York, and Oregon, maintain a permanent quarantine against psittacine birds.

Since the commercial aviaries engaged in the breeding and raising of shell parrakeets are the principal distributors of diseased birds and the sources of severe outbreaks (epizootics) among canaries and finches in pet shops, California has attempted to free the bird industry from psittacosis in that State. Anyone engaged in selling, trading, or bartering shell parrakeets must obtain a certificate of registration (California Senate Bill 516, 1933). According to regulations, the aviaries must furnish 10 to 20 percent of the birds for two laboratory tests before they may be certified and the birds released for sale. The parrakeets are killed and their viscera tested for virus through inoculation of mice. Aviaries found to harbor birds with the psittacosis virus are quarantined, and the owners are advised to destroy their stocks. The birds of a certified aviary wear a leg band with a code number assigned to them by the California State Department of Public Health. For interstate shipment, the United States Public Health Service requires a certificate issued by the State of origin. These control measures have progressively reduced the incidence of latent infections in California. In 1934, 47, or 23.9 percent, of 196 aviaries were found to harbor latent psittacosis, while in 1941, of 124 establishments only 7, or 5.6 percent, were infected. It is believed that annual retests and a more rigid supervision of dishonest breeders will in time eradicate the infected stocks in California.

PSITTACOSIS IN PIGEONS AND CHICKENS

The investigation of a fatal case of human psittacosis in California disclosed the important fact that the patient had frequently watched the return of some racing pigeons owned by his son. A blood-serum examination of the 30 pigeons involved was made, and 20 gave strong reactions indicative of a present or past infection with the psittacosis virus. The organs of the entire pigeon flock were tested on mice, and a virus similar to that of psittacosis was ultimately isolated from one of the pigeons.

While these studies were in progress, the father of another boy who owned a flock of racing pigeons outside Los Angeles contracted psittacosis. In this case, also, a psittacosis virus was demonstrated as being present in the kidneys of an old, emaciated, and definitely sick female pigeon in the loft.

In New York, a mother and daughter picked up a sick pigeon; both contracted a disease that was diagnosed as psittacosis at the Rockefeller Hospital. Of 30 pigeons obtained through the courtesy of the New York City Health Department, at least 20 gave positive serum reactions.

A group of pigeons obtained from a dealer in the San Francisco Bay area were held in crowded cages in a damp room. Over a period
of a month, 8 birds died. On post mortem examination they showed lesions of emaciation, fibrinous pericarditis (inflammation of the membrane around the heart), and peritonitis (inflammation of the membrane lining the abdominal cavity), spleen tumor, and enlarged and engorged livers occasionally studded with small necroses. Since the culture yielded *Salmonella typhimurium* Castellani and Chalmers, the true cause of these deaths was at first not recognized. In view of the observations previously made, an examination of the exudates, or discharges, was instituted, and *Microbacterium multi-forme psittacosis* was found. The virus was isolated from two of the dead pigeons, and serum tests made on the remaining birds indicated that the flock had been heavily exposed to the virus.

The wide distribution in the United States of latent psittacosis in pigeons is further attested by the studies of Pinkerton and Swank, who recovered from the inflamed heart covering of pigeons held on a thiamin-deficient diet a bacterium indistinguishable from *Microbacterium multi-forme psittacosis*. It is amply supported by serum tests which have been recently made on birds from lofts located in various sections of California, South Carolina, and Iowa. Between 10 and 50 percent of the tests have produced positive reactions. Although the data are limited, they indicate the widespread existence of a psittacosis infection that possesses a highly adapted parasitism for pigeons. It must be reserved for future studies to determine its spread in the pigeon lofts, its relation to pigeon typhoid, its method of escape from the body, and, in consequence, its potential danger to man. In all probability, it is the direct handling of a sick pigeon that entails a certain risk. Methods of control that may be needed to protect the pigeon-breeding industry will have to be worked out in the future.

Once more in connection with the investigation of a human case of psittacosis, attention was called to the possibility that the high mortality of the chickens on a farm in New Jersey had some definite relationship to the case. Investigations led to the isolation of the psittacosis virus from two chickens from this poultry ranch. The disease agent resembles that found in pigeons in a great many ways. How the infection was brought to the poultry-raising establishment is not known. It is not unlikely that doves or pigeons may have introduced it. As early as 1933, Meyer and Eddie observed the transmission of psittacosis to chickens held in a pen with psittacosis-infected parakeets. The innate susceptibility of the fowl to psittacosis was thus recognized; in the light of the information presented, it must be looked upon as a potentially important poultry disease in the future. From both an economic and a public health point of view, it is imperative that these apparently new infections should receive prompt and detailed investigation.

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