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Oscar Felsenfeld
Hektoen Institute for Medical Research

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Diseases of Poultry Transmissible to Man

Dr. Oscar Felsenfeld

BRANDLY (1) in his extensive study listed the diseases transferred to man from poultry. From the epidemiologic point of view, such infections may be roughly divided into two groups:

(a) Diseases acquired by man through handling live birds or living in the vicinity of poultry raising establishments.

(b) Infections transmitted from birds to man during preparation or consumption of edible poultry products.

Poultry raisers may contract mycoses, Newcastle disease and psittacosis-orinthosis. The mycoses are usually confined to the skin or mucous membranes, as moniliasis and aspergillosis. Newcastle disease in man has been described only as a conjunctivitis. The psittacosis-orinthosis group of viruses usually causes long infections. Viral encephalitis of the equine, St. Louis and Japanese B types, is accepted by most authorities in the field as a disease propagated by mosquitoes (especially Culex) from symptomless fowl to man.

Persons handling infected poultry in a plant, shop or kitchen may acquire superficial mycoses, Newcastle disease, tularemia, listeriasis and swine erysipelas. We have not encountered proven human cases of mycoses, Newcastle disease or tularemia transferred from poultry to man. We had, however, the opportunity of observing the following infections which may be of interest to the veterinarian.

Early in 1944, two employees of a shop which dressed poultry became ill with conjunctivitis which did not yield to the usual medication. A bacteriologic consultation was called for. When the patients presented themselves for the collection of specimens, a follicular, hypertrophic conjunctivitis was observed in both of them. In addition, there was a shallow ulceration with irregular edges on the left cornea of one patient. Since granulomatous conjunctivitis and trachoma had to be excluded, small biopsies were taken from the tarsal conjunctivas, in addition to bacteriologic cultures and scratch-smears. The biopsies showed follicle-like accumulations of lymphocytes and monocytes. Such a picture has been described by Julianelle and Moore (2) and Graham et al. (3). The cultures yielded typical Listeria monocytogenes. Since the disease has been studied in Illinois by Graham and found in cattle, sheep and chickens, a search for the origin was carried out by culturing samples from the spleens of the poultry dressed in the shop. Five birds, originating from eastern Illinois, where Graham found listeriasis in fowl, yielded positive cultures. Thus the probable source of the infection was established.

While it is not believed that listeriasis is a frequent disease in man, one may suppose that more cases would be discovered if more attention would be paid...
TABLE I
Salmonellosis in Man

<table>
<thead>
<tr>
<th>Salmonella type</th>
<th>No. of outbreaks in the Chicago area*</th>
<th>1948–1950</th>
<th>Former Years (10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>S. typhimurium</td>
<td></td>
<td>101</td>
<td>34.2%</td>
</tr>
<tr>
<td>S. typhosa</td>
<td></td>
<td>59</td>
<td>20%</td>
</tr>
<tr>
<td>S. montevideo</td>
<td></td>
<td>31</td>
<td>10.5%</td>
</tr>
<tr>
<td>S. newport</td>
<td></td>
<td>20</td>
<td>6.7%</td>
</tr>
<tr>
<td>S. enteritidis</td>
<td></td>
<td>17</td>
<td>5.1%</td>
</tr>
<tr>
<td>S. anatum</td>
<td></td>
<td>10</td>
<td>3.4%</td>
</tr>
<tr>
<td>S. paratyphi B</td>
<td></td>
<td>9</td>
<td>3.0%</td>
</tr>
<tr>
<td>S. choleraesuis</td>
<td></td>
<td>7</td>
<td>2.4%</td>
</tr>
<tr>
<td>S. derby</td>
<td></td>
<td>6</td>
<td>2.0%</td>
</tr>
<tr>
<td>S. thompson</td>
<td></td>
<td>4</td>
<td>1.3%</td>
</tr>
<tr>
<td>S. bareilly</td>
<td></td>
<td>3</td>
<td>1.0%</td>
</tr>
<tr>
<td>S. give</td>
<td></td>
<td>3</td>
<td>1.0%</td>
</tr>
<tr>
<td>S. cubana</td>
<td></td>
<td>3</td>
<td>1.0%</td>
</tr>
<tr>
<td>Together</td>
<td></td>
<td>286</td>
<td></td>
</tr>
</tbody>
</table>

*Only outbreaks observed by the author are listed.

to other than meningitis forms of the human disease.

Late in 1942, three members of a farm family from southern Illinois were presented for bacteriologic examination with the tentative diagnosis of pyogenic infection of the hands. There was swelling and erythema of dark red color of the hands, with smaller, lighter patches and lymphangitis to the elbow and axilla. Simultaneously pain and limitation of the movements in the phalangeal, carpometacarpal and wrist joints were observed. The involvement of the articulations was much more extensive than one usually sees in pyogenic infections. Thus the tentative diagnosis of erysipeloid of Rosenbach was made, confirmed by the culture which yielded Erysipelothrix rhusiopathiae. The infected family did not have contact with farm animals but raised turkeys. Examination of birds from the turkey flock revealed the same organism.

Avian pasteurellosis is rare in man. We observed one fatal case of meningitis but could not trace down its source.

While these infections are of much interest, the frequency of occurrence of food-borne diseases transferred from poultry to man is of far greater importance. These are chiefly represented by salmonellosis, brucellosis and coccal infections.

According to Dr. P. R. Edwards (4) who did much work in the field of salmonellosis, poultry constitutes the greatest reservoir of salmonellosis in the United States. Hinshaw et al. (6), Edwards et al. (5), Bidwell and Kelly (7) and our group (8) showed that human infections with Salmonella follow the distribution of Salmonella in poultry. The increasing consumption of poultry in the kitchen reflects itself in a more frequent appearance of those types of Salmonella which predominate in birds. According to Darby and Stafseth (9), Hinshaw et al. (6), Edwards et al. (5), a.o., the leading infections in poultry are S. typhimurium, S. pullorum, S. bareilly, S. oranienburg, S. montevideo, S. newport and S. anatum. Salmonella typhimurium and S. newport are, however, frequently present not only

TABLE II
Examination of Poultry for Salmonella

<table>
<thead>
<tr>
<th>Poultry</th>
<th>No. exam.</th>
<th>No. positive</th>
<th>Percent positive</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S. graded A and inspected, frozen, prior to 1950 type</td>
<td>110</td>
<td>3</td>
<td>2.7</td>
</tr>
<tr>
<td>Grade A, not inspected</td>
<td>70</td>
<td>8</td>
<td>11.8</td>
</tr>
<tr>
<td>Ready-to-cook, frozen, 1950 type</td>
<td>50</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Not graded, not inspected</td>
<td>60</td>
<td>8</td>
<td>13.3</td>
</tr>
</tbody>
</table>

* Iowa State College Veterinarian
in birds but also in animals and in human carriers. The other strains of Salmonella distinctly predominate in birds. Of the Salmonella types less common in man, S. gallinarum and S. cuneana may be pointed out as examples of purely poultry-borne agents. Edwards and numerous other authors listed cases of human salmonellosis which were found to be caused by the consumption of infected poultry meat or eggs. Our own epidemiologic studies in North and South America (10) listed 13 human outbreaks in which the causative Salmonella could be recovered from fowl meat as well as nine human outbreaks in which the same Salmonella was recovered from eggs and egg products and from the patients who ate them. To this we have to add one instance in which S. cuneana was recovered from frozen poultry and the family which consumed part of it; one more case of S. pullorum enteritis described by Morrow et al. (11) from our institute; and one isolation of S. gallinarum from a human carrier (12). Comparative tabulations published by Kessel et al. (13), Edwards et al. (5), by us and by numerous other writers confirmed that the distribution of salmonellosis in man in the United States runs parallel to a certain extent (with the exception of S. typhosa, S. pullorum and S. choleraesuis), to the distribution of Salmonella in fowl. Our recent statistics, collected during the last two years, show a considerable decline in paratyphoid B infections in man, a phenomenon observed also by Dr. Edwards. This reduces even more the participation of Salmonella of non-poultry origin and leaves man, water, rodents and poultry as main harbingers of human salmonellosis.

It remains the task of those who supervise the health and the wholesomeness of poultry to proceed from here. Our group carried out extensive surveys which showed that federally inspected poultry is carrying Salmonella less often than products which were only graded or not examined at all (8). Since the new inspection and grading system went into effect in 1950, little work could be done by our group. It seems that frozen “ready-to-cook” chickens are less often infected with Salmonella, but harbor these organisms more frequently, than the inspected products, prior to 1950, which were examined on postmortem by a veterinarian. Our results are, however, only preliminary and the final outcome of the investigations may be different. Quite disturbing is the great number of S. typhimurium strains (about 1 percent of the samples) isolated from poultry put on the market without the benefit of inspection by a qualified veterinarian, under the name of “ready-to-cook” chicken. Plant sanitation, still lagging behind recent legal requirements, may contribute to this phenomenon.

In our experience, Salmonellae survive for a long time in and on frozen food. Soloway and Calemick (14) and Stafseth and his group carried out numerous experiments, especially with eggs, to determine whether or not Salmonellae are destroyed by procedures used to prepare food in the kitchen. There seems to be a good chance for these organisms to survive several ways of food preparation. Since certain ways of preparation, such as poaching, certainly do not kill Salmonellae, the eradication of poultry-borne human salmonellosis is still the problem of raising healthy birds and of proper post-mortem inspection by a qualified veterinarian.

Another human disease in which poultry may play a role is brucellosis. Huddleson and co-workers showed that chickens can be infected with brucellosis. Workers under Dr. Brandly in Wisconsin proved the existence of this disease in poultry. My own experience in East Europe has been that poultry carries brucellosis, often without showing clinical symptoms. Recent experiments in this institute proved that chickens fed with Brucella will excrete these organisms for a period up to 8 weeks in their stools and that uninfected birds housed with Brucella-fed chickens will pick up the infection and carry it for several weeks. Since blood cultures frequently become positive during such infections, chickens may serve not only as vectors of brucellosis on the farm but if slaughtered during the bacteriemia, may provide meat that is in-
fected with Brucella. One has to wonder if cases of brucellosis, appearing in persons who have no contact with animals and do not drink raw milk, could not be traced sometimes to poultry.

Finally, we have to consider food poisoning caused by Staphylococci, Streptococci and Enterococci. Since food poisoning organisms of these types are frequently present in birds, especially in their digestive and respiratory apparatus, the contents of which are so easily smeared by the housewife or by an unskilled or inadequately supervised food worker over the edible parts, one should pay more attention to inspection and sanitation in the preparation and handling of poultry. Outbreaks of coccal food poisoning even if far less dangerous than salmonellosis, are too frequent for the comfort of public health workers, and measures aimed to reduce them are more than welcome by all interested parties.

Summarizing, one cannot overlook the importance of poultry in human disease. From the point of view of human medicine, the concentrated efforts of public health veterinarians and sanitary engineers, together with the understanding of the poultry industry for betterment and progress, are most commendable.

The paper of Dr. Paul Brandly on poultry inspection (1) enumerates all pitfalls encountered in this work and is a classic document in favor of inspection. The industry, on the other hand, has strong arguments against inspection by pointing out the shortage of veterinarians and the costs of inspection. It is only hoped that ways and means will be found to establish a proper sanitation program on the chicken farms, as well as in the industry, connected with adequate inspection on the eviscerating line.

References

The most nearly correct rectal temperature in pigs is found approximately six inches anterior to the anus. The average is somewhat over 102°F. The minimum may be as low as 97.2°F., with a maximum of over 106°F.

A loss of one pint of blood per adult sheep per day is the estimated result of a fairly heavy stomach worm (Haemonchus contortus) infection.

Foot-and-mouth disease is rare in man. Smallpox vaccine contaminated with foot-and-mouth disease virus did not infect children vaccinated with it though cattle were infected.

Compulsory vaccination with live virus vaccine of all poultry in areas infected with Newcastle. That is the requirement in South Africa. We have used a live virus Newcastle vaccine here, but it has not been compulsory to vaccinate.

Iowa State College Veterinarian