

THE PUBLIC HEALTH ASPECTS OF POULTRY INSPECTION

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INTRODUCTION

During the past forty years, the survival of industry has been increasingly dependent upon its ability to keep abreast of the changes that advancement in the fields of science has provided. These changes have been responsible for specialization. Time has become increasingly valuable, and competitions in industry quite keen. Specialization in the food processing industry has made its share of advancement. The home and kitchen are no longer the food manufacturing and processing unit that for so long was traditional. The home and kitchen can no longer economically compete with industry in the manufacture of the many items of food. Nearly every culinary item found in the modern kitchen or market is the result of a more or less extensive specialized process, and they are purchased by the consumer, in so far as possible, ready to serve. This trend has resulted in the consumer's having no knowledge of the conditions under which his food is processed and handled.

Competition and specialization have had their effect in stimulating undesirable and dangerous practices in industry, and consequently there has developed along with these changes various agencies established for the purpose of supervising and regulating these industries. These organizations are charged with the protection of the consumer from fraud, as well as protecting his health and his esthetic senses.

Every processor of any food and drug item offered for

sale is subjected to some type of supervision. The work of these agencies in developing standards of manufacturing and processing has had a wholesome effect. Those who engage in such business have been made aware of their obligations to the consumer, and consequently the American public buys with confidence.

The poultry industry can probably be safely considered as among the latest of those to begin specialization. The nature of the industry does not readily adapt itself to specialization. It has been virtually without sanitary supervision because of the large number of small operators and the shortage of inspectors. The same inherent obstacles that retard specialization in the poultry processing industry likewise delay the development of an ideal inspection program.

The careless methods of handling poultry through the years justify the "cautious" attitude that exists in the mind of today's discriminating consumer. Poultry is heir to its share of diseases, and harbors a number of microorganisms which may affect man, and it is proper that the consumer be assured of the wholesomeness of the poultry he buys.

The recent trend toward specialization and attempts to devise means of supervision have presented many problems and today only a small percent of the poultry processed and sold has been examined for disease or had any sanitary supervision in the dressing process.

The present limited means of supervision are not satis-

factory and a great deal of work is urgently needed. A survey of existing conditions in the industry, with a study of present regulations and the incidence of disease was undertaken for the purpose of securing information that may be useful in improving the situation.

SURVEY OF THE INDUSTRY

The Production Industry

History. Poultry farming as an independent business is of rather recent development. Prior to World War I, poultry was essentially a sideline industry. The poultry population in general was not operated on a commercial basis. Almost every farmstead maintained its small flock of barnlot fowl, which supplied eggs and meat for the family, and any surplus was marketed at the small local market. Natural hatching was the usual method and was confined to the spring season. Interest in production, type, nutrition and improved husbandry practices were of little concern. Under these conditions, egg production was low and young poultry grew slowly. Available vegetation, insects and waste grains seemed to meet nutritional requirements. Birds usually had the run of the entire premises. These factors seemed to substitute fairly well for the sanitary practices necessary where flocks are kept in confinement.

Changes of Methods and Their Effect. Significant changes have come about in the more recent years in the methods of production and management as shown in figures given by Stafseth (1). In 1929 the value of the poultry industry in the United States was \$1,368,999,705. In 1946 it was \$3,291,789,000, or a two billion dollar increase. In 1929, the value of turkeys was \$47,767,826 and in 1946 it was \$272,996,000. In 1929, 272,403,962 chicks were hatched. In 1946, the number increased to 1,265,538,000. In 1929, only 18 percent of the chicks hatched were produced in commercial hatcheries. In 1946, this percentage had increased to 83.85.

Twenty-five years ago, practically all poultry meat came from farms as a by-product of egg production, and the turkeys came from small farm flocks. Today, nearly half of our chicken meat comes from specialized meat producers' flocks, and more than half of the turkey meat is from such flocks. The rearing of ducks and geese has become a specialized industry. The recent rapid changes are shown in figures by Termohlen (2). He states that in the 5-year period (1935-39) the number of commercial broilers produced in the United States averaged annually about 70 million. In 1949, this had grown almost seven times to 487 million. In the same period of time, the poundage of turkeys slaughtered had more than doubled. Many large broiler plants are today turning out thousands of birds without regard for season, and many farms maintain flocks of thousands of hens for egg production.

The conversion to mass production methods, the concentration of the poultry population in certain localities, and the rearing of fowls in confinement, have made poultry production of today a science. Under these conditions it must be economically sound. It must be profitable, and not dependent upon other farm production. The poultryman, if he is successful, must have a general understanding of nutrition, sanitation and management problems, and must apply them intelligently. Selection of breeding stock has resulted in rapid growth, and high producing birds. Such methods of management always invite disease, but increasing understanding of the problems by poultrymen and the advancement of scientific methods of control are encouraging. From the standpoint of the final foods product, modern trends are rapidly improving the situation by the elimination of chronic diseases that occur in the range type birds. The marketing of hens after the first laying season and the replacement with young stock have reduced the incidence of disease. Segregation of birds of different ages has its advantages. The testing of laying flocks, where hatching eggs are obtained, for pullorum disease has greatly reduced its incidence, and the producer following modern methods has done a great deal toward supplying the consumer with a healthier and more palatable poultry product.

The Marketing and Processing Industry

Marketing Live Poultry. There remains, however, enough of the scattered "sideline" methods of production to justify the existence of some type of poultry market in every community. Many of these markets also are "sideline" operations, and are maintained in conjunction with grocery and feed stores or cream buying stations. Some small markets in the larger towns slaughter poultry to be sold fresh to the consumer, and the surplus from both types of markets goes to the larger feeding and holding stations. This may be sold directly to large eviscerating plants, if properly located.

Processing and Marketing Dressed Poultry. Many small plants depend on the local sale of dressed poultry for their market. Other small "sideline" markets are tributaries to the larger central feeding stations. Some of these feeding stations dress and pack "New York" dressed poultry, which may be marketed in that condition, or it may be sent in the chilled or frozen state to the large eviscerating plants where it is thawed, eviscerated, and repacked. A few of these large plants operate under some sort of inspection, but only a small percentage of the poultry has any inspection, and a much smaller part is freshly eviscerated.

The processing of poultry in the scattered small plants without supervision is not desirable. The practice of "New York" dressing either for direct retail sale or to be held for

later evisceration likewise is not desirable. The ideal situation would be to perform the complete process--killing, eviscerating, cutting, freezing and packaging under supervision and in sanitary surroundings. There are many economic factors that have retarded progress along this line. First is probably the widespread nature of production. The seasonal marketing of poultry greatly exceeds the capacity of plants equipped to do the complete operation. Adequate facilities and personnel to care for the rush marketing seasons cannot be provided. The transporting of bulky live poultry from its point of origin to such central stations is impractical.

Custom has also played a part in establishing some undesirable practices and in consumer acceptance of those practices. The practice or custom of aging poultry by some nationalities has had some influence. New York State prohibited the importation of eviscerated poultry when it was determined that diseased poultry was being dumped upon certain importing areas that had inadequate supervision.

Recently, the industry has come to agree with regulatory officials on the inferiority of such products, and they are working toward fresh evisceration methods as rapidly as possible. Kansas has outlawed the sale of the "New York" dressed type product, as have one or two other states. Other states that formerly demanded "New York" dressed products will now accept eviscerated products that are processed under approved supervision.

Sanitation. Sanitation, as used by the food processing industry and by food and drug officials, has both a broad and a very technical interpretation. It may be used in referring to the bacteriological condition of food, or it may refer to the physical appearance of an establishment. Here it may include construction, equipment, methods of food handling, refrigeration, etc. Sanitation is applicable to every part and every operation, and is the most important single phase of any food processing operation.

Construction and Arrangement. Few of the poultry buying, feeding and processing plants of today approach the ideal in regard to construction and arrangement to provide for sanitation. Probably no other food processing industry is permitted to operate today with such low standards of sanitation. Many of these establishments occupy old buildings that are of frame or sheet metal construction. Many of the partitions are constructed of scrap lumber, woven wire, celotex or old cardboard. Many have wooden floors that cannot be cleaned. Some places were found with holding and feeding pens in basements with dirt floors. Such basements were often without windows and without natural light and ventilation. The walls of those basements were usually of unfinished rock that sheltered rodents and insects that fed upon the filth of these dirt floor battery rooms. Such establishments are obviously unsanitary and constitute public health problems.

Many of the plants are old, and their age is reflected

also by poor arrangement. In plants catering to local trade, the practice of the customer's choosing the live bird and having it dressed had fostered the placing of the holding rooms in the front of the buildings. Arrangements for processing were made in the rear of the building. Most cities prohibit the exhaustion of air from these plants through openings in the front of the buildings because of odors, dust and feathers being discharged upon the sidewalk and street. Consequently exhaust fans carry the air and its contents from front to rear-- from the battery room through the processing room, discharging that which does not cling to the moist surfaces of processing equipment into the alley.

Plants were commonly found where changes in operation had been made ahead of necessary physical changes. Plants that were originally designed for holding and feeding had been converted into dressing plants, and such plants are usually handicapped from the standpoint of sanitation.

Waste products often had to pass here and there through the plant where they should not have been permitted. Eviscerating or packaging rooms were often located where they could not escape the dust of live poultry traffic. Such arrangements make for inefficient operation, and they make sanitary procedures most difficult.

Sewage and Waste Disposal. The lack of adequate facilities for the disposal of wastes in these converted type plants was

also a common finding. Floor drains were improperly placed or lacking. Most cities prohibit the dumping of blood and manure into the sewer because of the limited capacity of the disposal plant and the high B. O. D.¹ of such materials. These factors were responsible for the presence of dirty containers, loading docks, and trucks at many of the plants. In some instances, this material was removed from the plants by rendering companies, but in general, this was no improvement. The rendering companies were not punctual in the pickup, and flies were found swarming and hatching in containers of decomposing material. Dirty containers were returned to the plants, and were handled by the personnel. They were sometimes found in the processing rooms and coolers.

Equipment. The equipment used, and the methods of processing depended upon the capacity of the plant, but in general the procedure was the same. Scalding equipment was found to vary from a simple hot water container to large line vats or spray scalders. Some were designed to provide a constant change of water. Various makes and sizes of picking equipment were found, however, all operate on the same principle. They consist of revolving drums fitted with rubber "fingers" that strike the bird and knock the feathers off. Mechanical washers operate similarly except the fingers are longer, and strike the poultry while it is going through a forced water spray.

¹ Biological Oxydation Demand.

The cooling tank or soak tank was an interesting piece of equipment. It is used to cool the poultry before freezing or dry cooling. Ice water, ice, or cold running water were used in better plants. In some, standing water was used, and often was dirty. Some tanks were found rusty with uncleanable welded seams. This method of cooling has been the subject of considerable controversy, both from the standpoint of contamination and water absorption.

Many pieces of equipment were not cleanable. There were wood, or wooden top tables, rough blocks and rusty metal surfaces. These articles under proper supervision would be condemned.

Premises. Sanitation problems connected directly with processing are perhaps most important, but sanitation in all parts of the plant is important. Dirty toilet and dressing rooms were almost a constant finding. Rooms were often cluttered with feathers, egg shells, flies, odors and occasionally dead chickens. These conditions have a definite influence on the habits of the food handlers and others in the plants.

The careless habits developed by employees were clearly demonstrated by the technique employed in opening the body cavity and evisceration. In many instances, the incisions extended into the cavity, dividing the gut in one or more places. Such incision made sure that the next operator on the line would smear the inside of the bird, and part of the outside

with the contents of the bowel. Operators seemed unaware of their predicament, and drew bird after bird with no thought of washing their hands. This abominable practice is avoidable, and should be vigorously condemned. Perhaps such techniques of evisceration influenced the thinking of those who for so long contended that "New York" dressed poultry kept better.

Rodents, Flies and Roaches. The population of these pests depends upon two things--food and shelter. Many plants provided these, and were found to be inhabited by the pests. The dirt floors, rock walls, frame and junk construction, feed and filth provided ideal conditions for vermin. Evidence of rodents was found in almost all plants. In general, they had access to the entire plant, cooler and freezer rooms being usually excepted. Occasionally, however, they were found in poorly constructed and carelessly operated coolers. The flesh of stored poultry provided food, and the body cavities of packaged birds were ideal quarters for nesting and brooding of the young.

Fly control was practiced to some degree in most plants, but in general, a nominal fly population was being tolerated, and new control efforts were made only when invasions were severe. There was a distinct tendency to depend too much upon the use of insecticides. Battery rooms, where poultry, manure, and sour milk feed mixtures were used, were not screened. Breeding and feeding grounds must be eliminated before sprays

will be effective.

Roaches were observed in many plants but did not present such problems as did rodents and flies.

Disposition of Diseased Birds. In plants where veterinary inspection is not maintained, the disposition of the carcasses of dead and diseased birds is determined by plant operators or employees. Those that yield discolored, dark blue carcasses resulting from the terminal stages of disease, and those that are emaciated from progressive localized disease are usually condemned. In plants where inspection is maintained, diseased birds are condemned at the discretion of the veterinarian who is guided in his actions by the decisions outlined by the control agency.

Fraudulent Practices. "Paddling" is a term applied to a procedure occasionally employed to improve the appearance of carcasses bordering on emaciation and presenting a sharp sternum. By placing the bird on its back, and striking the sternum with a paddle with sufficient force to fracture it in several places, it can then be manipulated to give the bird a more plump appearance.

"Washing". Various solutions such as salt, acetic acid, sodium bicarbonate, sodium benzoate are used to wash birds for the purpose of limiting the growth of putrefactive and slime producing organisms. These methods serve to change the surface appearance and to camouflage odors that accompany tissue decomposition.

"Plumping", or hard scalding are procedures used to change the appearance of carcasses that are of poor quality or are cyanotic from systemic disease. Placing carcasses alternately in extremely hot, then in ice water serves to bleach and plump poor quality, discolored carcasses.

"Loading" consists of gorging birds with a palatable wet mash for the purpose of increasing the weight of those to be sold "New York" dressed. Sometimes fine shot is mixed with the feed to increase the weight before dressing.

"Sanding" is a similar practice to that of "loading" except fine sand is mixed with the palatable wet mash and the birds gorged on this material prior to slaughter.

"Plugging" is a term applied to the incorporation of materials such as plaster of paris in mash. These materials swell, and "set up" in route through the alimentary tract, lodging in the gut near the caeca and thus preventing defecation and causing a gorging of the gut before slaughter.

"Needling" is the injection of water into the tissues, or in the case of entire birds, into the abdominal cavity, for the purpose of plumping and gaining of weight. When this water is injected into the tissues, it is quite difficult to detect by any means.

"Stuffing" or "force feeding" was widely practiced until quite recently. It was practiced under the pretext of "milk fattening" of poultry in the battery rooms. The device used

to deliver the mash was a foot operated pump with a long tapering spout. The bird's mouth and esophagus were placed upon the spout, and as much as a pound or a pound and one-half of mash could be forced into the crop of a chicken or turkey. Crops were occasionally ruptured by inexperienced operators. Though this procedure was prescribed by the industry for fattening, it was generally found that in birds to be sold "New York" dressed, they were slaughtered before the digestive tract returned to its normal capacity.

"Soaking" has already been mentioned briefly, and is probably practiced more today than any other method of avoiding loss of weight or "shrinkage". It is promoted as a desirable cooling method, and probably has worse aspects than that of weight increase in that the soaking water is often quite dirty.

"Venting", or emptying of the rectum of "New York" dressed birds is recommended for preventing a condition known as "green struck". This term is applied to a discoloration around the vent or crop where the material penetrates the tissues or leaks out onto tissues of other birds in the pack. Omission of this practice results in gain in weight, and requires less labor.

In general, most of these practices have been discontinued, but occasionally they are still employed by the unscrupulous operator.

Progress and Improvements

The poultry industry has its share of shortcomings as has been pointed out, but the recent stress that has been placed upon poultry sanitation has resulted in much improvement.

Sanitary officials and the industry are spending more time than ever before on poultry sanitation. The larger companies have their own sanitarians and have bacteriologists who work on plant sanitation, equipment design, pest control, methods of packaging and freezing and other sanitation problems.

"In plant chlorination" is one of the more interesting recent studies made in plant sanitation, and one that could have a great effect on the industry. The process amounts to the addition of ten to twenty ppm of chlorine to the water supply used in processing.

Gunderson et al. (3) report that almost all bacterial contamination in dressed poultry is found on the body surfaces. The meat may be considered sterile unless a bird is diseased in the muscle area, or has been contaminated by some unsanitary practice. Bacterial contamination comes from flora on the skin of the live bird, mud and filth from the feet, and crop material and feces forced out of the bird during processing. Certain equipment or handling methods may spread these contaminating materials over the surface of the bird, providing an inoculation of spoilage and slime bacteria,

or bacteria of public health significance.

The work done to demonstrate the effect of this chlorinating procedure consisted of following identified birds, marked with metal tags, through the processing line, and sampling the surfaces for organisms at various points along the line. The work was done in one of the larger plants where different types of equipment were available. Samples were taken preceding and following certain processing steps. Some types of equipment tended to increase surface contamination, others reduced it. On eviscerated birds, samples were taken from inside surfaces as well as outside. The results are shown in Table 1.

In addition, Gunderson (3) and other workers claimed that a pronounced odor that developed when the plant was closed over the weekend or for a period of 48-72 hours was eliminated by the use of these chlorinating methods.

This work would indicate that this method of contamination control would be most effective in improving the keeping quality of poultry, as well as being an effective public health measure. However, it is a situation analogous to that of the pasteurization of milk. It must not be depended upon to substitute for other sanitary measures.

Table 1. Results of in plant chlorination tests (3).

	: No chlorine in processing water	: Chlorine in processing water
	: processing water	: 10 ppm ; 20 ppm
Average bacteria on skin of dressed birds washed mechanically and ready to chill	136,000/sq cm	85,000/sq cm 4,000/sq cm
Average bacteria on chilled birds washed mechanically before evisceration	28,000/sq cm	11,000/sq cm 2,000/sq cm
Average bacteria on chilled birds washed & ready to cook	17,000/sq cm	9,000/sq cm 500/sq cm
Bacteria in water flowing from mechanical washer	2,500,000/ml	300,000/ml 6,500/ml
Reduction of bacteria on plant equipment & working surfaces		90-99%
Clean up time after day's work	13 hours	8-9 hours

PRESENT REGULATIONS

For some twenty-five years the Poultry Branch of the Production and Marketing Administration of the U. S. D. A. has offered poultry grading and inspection service to the industry on a voluntary basis. This program has undergone many changes as requirements of the industry demanded. In the beginning, it provided for grading of dressed poultry based on the physical appearance of the carcass or in other words, on quality only. There were no sanitary requirements for official plants requesting grading. Sanitary standards were set up only for plants requesting inspection for wholesomeness on eviscerated birds. This has since been changed, and plants requesting either service must meet certain sanitary standards. The program sponsored by this agency has been responsible for considerable improvement, however, some phases of it have been widely criticized. It is the opinion of many that an agency primarily interested in promoting the production and marketing of agricultural commodities cannot function as a regulatory body, and serve the best interests of the consumer.

There has been great objection to the placing of grade labeling, such as grade A, upon poultry carcasses that had had no inspection for wholesomeness, or had not even been eviscerated. The argument has been vigorously advanced that this misleading grade labeling would create an objectionable

public opinion regarding regulatory agencies.

At present there are no compulsory regulations governing the processing and sale of poultry except those food and drug laws dealing with foods in general. They prohibit the sale of dead or diseased animals. They also prohibit adulteration, and outline minimum sanitary requirements for food processors in general. The burden of proof, of course, lies with the agency, and adulteration and sanitation under such provisions become quite an arbitrary factor.

A few states have recently adopted more stringent poultry regulations, and require licensure of poultry dressing plants. They may also offer a voluntary inspection program. Other states are at present attempting to do something about poultry sanitation and inspection, but only a small percentage of the poultry today is processed under sanitary supervision and inspected for wholesomeness, as is shown in Table 2.

Table 2. Volume of poultry sales by farms and poultry¹ inspected by Federal inspectors by years 1932-1950 (4).

Year	Sales ²	Quantity		Certified for:		Rejected	Percentage inspected
		inspected	1,000 lbs. ¹	canning	evisceration		
1932	1,675,918	14,516				493	0.87
1933	1,769,308	15,317				468	0.87
1934	1,707,938	18,461				538	1.08
1935	1,601,540	23,266				516	1.45
1936	1,826,165	32,951				697	1.80
1937	1,746,294	43,579				739	2.50
1938	1,675,521	43,539	34,480	8,265		794	2.60
1939	1,976,843	62,508	41,357	20,282		969	3.16
1940	2,155,103	77,591	50,137	26,181		1,273	3.60
1941	2,414,205	94,499	61,591	31,335		1,573	3.91
1942	2,873,907	147,301	86,146	59,241		1,914	5.13
1943	3,674,767	180,911	84,657	94,518		1,736	4.92
1944	3,555,159	178,766	97,194	79,350		2,233	5.02
1945	3,931,438	227,917	112,820	113,175		1,923	5.80
1946	3,417,799	282,254	123,889	155,676		2,789	8.26
1947	3,269,182	203,101	79,994	121,487		2,639	6.21
1948	3,000,905	293,504	141,136	146,675		2,455	9.78
1949	3,765,030	349,574	124,114	223,025		2,455	9.29
1950	4,050,866	486,937	145,878	338,017		3,042	12.02

¹ Dressed weight; Computed on basis of chickens 88 percent of live weight; turkeys 91 percent of live weight.

² Compiled from statistics of Bureau of Agricultural Economics.

DISEASES OF POULTRY AND MAN

The term wholesomeness as it is often used in inspection work has been rather ill-defined. The question of disposition of carcasses showing visible evidence of disease processes not considered communicable to man is a controversial one. The bacteriology involved in the usual mill run poultry processing operation and the obvious constant presence of potential pathogens probably are of much more importance than the problem of poultry disease itself. However, there exists a number of diseases common to man and poultry, and though they are essentially occupational diseases, and cannot be eliminated by gross examination, they are an important part of the poultry inspection problem, and their nature and significance to poultry inspection are very briefly considered here.

Brucellosis

Brucellosis is defined by Huddleson et al. (5, p. 51) as a systemic or focal infection caused by Brucella abortus, Brucella melitensis and Brucella suis. In man, it is characterized by weakness, fever with morning remissions, occipital and frontal headache, muscular pain, profuse sweats, chills, constipation, secondary anemia, nervous disturbances, and metastatic involvement of the joints, the eyes and reproductive organs.

Huddleson et al. (6, p. 65) cite a clinical description of the disease in humans by Hughes, who stated in his chapter on symptomatology that so variable are the symptoms and so uncertain is the duration and course of the fever that it is impossible to give any description to which all cases can be referred.

Discussion of its occurrence in poultry by Stafseth (7, p. 353) and others indicate that it is of little importance.

The disease is reported to be contracted by infestation of the organism, inhalation, infection of the conjunctiva, or through the unbroken skin. It cannot be identified on post mortem, except by laboratory methods, and would have only limited significance as far as inspection in the plant is concerned.

Erysipelothrix Septicemia

Erysipelothrix rhusiopathiae infection in man is discussed briefly in the medical literature, and for the most part is associated epidemiologically with the disease in swine. Shell fish are mentioned as a source of infection, and cases have been traced to bone button manufacture. It is also reported to occur in housewives and packinghouse workers, apparently from exposure to meat and other contaminated food products. Hull (8, p. 141-143) reports that swine erysipelas is conveyed to man through abrasions of the skin, resulting in a local

infection commonly termed erysipeloid. Generalized conditions of arthritis, cutaneous eruptions and other constitutional symptoms have been reported.

The disease has more recently been identified in poultry where it appears as a septicemia. Turkeys are particularly susceptible.

Diagnosis of this condition in poultry requires more than a casual observation but its incidence could be reduced by careful examination of carcasses, and the condemnation of those showing signs of septicemia.

Listerellosis

Listerella monocytogenese infection in poultry, though apparently not prevalent, has been reported in increasing frequency the past few years. It appears as a septicemia, but the involvement of the central nervous system as with other animals has not been reported.

Paterson (9) cites several cases of human Listerella meningites in North America, but the incidence of the disease, either in poultry or in humans, indicates that it would constitute only a very minor public health problem and one that would be at best only slightly affected by poultry inspection.

Aspergillosis

The diseases caused by fungi are probably the most important of those which may be contracted from poultry, but the incidence of it is small as is shown in the reports of diagnostic laboratories. According to Bullis (19, p. 403), the spores of the organism are widely distributed in nature, and in general it is referred to as an occupational disease.

Favus

The genus *Achorion* is mentioned as the cause of dermatomycoses in man, Brandley (11), Carter (12, p. 414), and Hymen (13, p. 3304). In general the literature is not specific as to identification of species, or to the existence of the disease in the United States.

Thrush

Thrush or *Moniliasis* in poultry is a disease causing general unthriftiness. This results from involvement of the linings of the mouth and upper respiratory and digestive tracts, causing a thickening of those tissues that is conspicuous for the absence of lack of inflammation.

In the human, it occurs principally in children, but it is usually not found in normal, healthy individuals, but occurs

in undernourished subjects under poor conditions of sanitation. Dubois (14, p. 601) states that *Candida* (*Monelia*) species are normal inhabitants of the mouth, intestinal tract, and small vagina, and can be cultured from these locations in 35 to 40 percent of normal individuals.

Avian Pneumoencephalitis

Avian Pneumoencephalitis or New Castle disease has been identified only recently in the United States. A disease entity described as a pneumonia and encephalitis appeared here and there in the United States, but the etiology was not definitely determined until about 1940. Since then it has been identified in many states and in general is considered to exist throughout the United States.

The literature on the subject of human conjunctivitis caused by Newcastle virus is limited and rather nonconclusive but is mentioned by Felsenfeld (15) and Brandley (11). Work now being done on this subject will probably provide some information in the near future.

Ornithosis

This disease, determined to be caused by an elementary body, is probably of more interest from the standpoint of its significant epidemiological history than for any other reason.

Meyer (16, p. 527) has probably done more work with this disease than anyone, and has written extensively on the subject. He points out the alarming incidence in pigeons, the epidemiological findings, infectivity, and the fact that human cases have been traced to chickens.

Recent outbreaks have been reported from Texas by Irons, Sullivan and Rowen (17) where an outbreak of atypical influenza-like condition in Negro poultry plant workers was concluded to be Orinthosis.

The complexities of the disease are obvious from the studies that have been made. A review of the literature, however, indicates that the incidence of the disease in birds, the infectivity of the virus, and the incidence of the disease in humans have so far been poorly correlated.

Equine encephalomyelitis

The susceptibility of poultry and other birds to neurotropic viruses has been demonstrated by various workers. Giltner (18, p. 561-565) discusses experimental transmission, and mentions natural transmission by mosquitoes and other arthropoda.

The existence of the disease has also been established in humans, however, the low incidence in poultry makes its transmission from this source to humans a remote possibility rather than a probability.

Tuberculosis

Avian tuberculosis is perhaps worthy of mention here due to its high incidence in poultry, and the undesirability of tuberculous poultry carcasses for food. Authorities seem generally agreed that possibly the avian type infection may occur in humans, but that it remains benign and localized. It does, however, develop extensive lesions in the rabbit and swine.

In the United States, the disease in poultry occurs principally in the north central states. Feldman (19) refers to figures that indicate as many as 50 to 60 percent of the flocks in some areas are infected. Tuberculosis is one of the diseases most commonly found on the inspection line in this country, and is at least an economic problem that can and should be corrected.

Salmonella Infections

Some fifty of the 150 organisms placed in the Salmonella group have been recognized as the cause of enteritis in birds, Fenstermacher (20, p. 247-248). Most authors group these organisms in a rather general grouping designated "Paratyphoids", however, some do not include S. pullorum or S. gallinarium (Shigilla).

These two organisms are the ones most commonly encountered

in poultry, and except for a limited number of recent observations, they have not been considered important pathogens of man. Recent findings indicate that the entire group are potentially infectious for man, while some are primarily human pathogens, others are pathogenic for one or another species of animals.

There is ample evidence to show that poultry harbors a considerable amount of paratyphoid infection. Poultry is commonly incriminated as the vehicle for human cases of food poisoning, food infection and gastroenteritis. In the Report (21) of the National Office of Vital Statistics on food poisoning and food infections, 459 listed outbreaks were traced to poultry and poultry meat dishes for the years 1941 to 1950, inclusive, excluding 1944. Of these outbreaks, 252 or over half of them were traced to turkey. Considering the comparative amounts of chicken and turkey consumed, the size of the birds, and the likelihood of more cold or warmed over turkey being eaten, the indications are that the problem is one of food handling more than of poultry diseases. It may be noted that where cases were traced to poultry, that Staphylococci were more often the offenders than were the Salmonella, which is further evidence of faulty sanitation. The Salmonellae are likewise destroyed by ordinary pasteurization processes and it would be unlikely to survive normal cooking.

There are other diseases of poultry that could well be considered transmissible to man: anthrax, sarcosporidiosis, streptococcosis, staphylococcosis and others. They are, in

general, occupational diseases, of rare occurrence like those described, and as food born infections are of little importance here.

SUMMARY AND CONCLUSIONS

With the rapid increase in the human population and the tendency of the population to locate in urban areas, public health becomes an increasingly important problem. As these changes occur, standards of living often tend to be lowered, rather than raised, as they should be. In maintaining good health, adequate and wholesome food is a paramount factor. Food and drug officials and food processing companies must consider such factors in making future plans.

After carefully considering the existing conditions in the poultry industry it seems fair to conclude that this industry is lagging behind so far as sanitation is concerned. Through the years, it has been neglected and without proper study. The industry has run the gauntlet of cure alls looking for the answer to its disease problems, and today poultry harbors many diseases that should long since have been eliminated and such diseased poultry is being sold for food. Problems of sanitation other than disease problems have been handled similarly, so today one of the important food items comes to us with quite a shabby reputation.

It seems timely that consideration be given to correction of many of these situations. These changes are dependent upon action by regulatory officials, and should be started by outlining minimum sanitary requirements. Such establishments should be licensed and required to meet the sanitary requirements before the license is issued.

Buildings should be arranged and constructed to facilitate easy and thorough cleaning. They should be fly and rodent proof. All rooms and compartments should be kept clean at all times, and the personnel should be taught to respect a clean plant and assist in keeping it so.

The premises should not attract pests and should have an appearance that would become a food processing establishment.

Fraudulent practices should be condemned, and those who employ them should be vigorously prosecuted. Law enforcement agencies should be forced to take action against operators who promote or condone some of the filthy practices observed in this survey.

In due time, inspection for wholesomeness should be made mandatory, and all poultry showing evidence of any disease that may result in the presence of toxic or noxious and repulsive substances in the tissues, should be eliminated from food channels. This inspection should be done by qualified persons who can identify these diseases, and who understand the epidemiology of diseases both in poultry and other animals so that preventive measures can be provided.

The problem of poultry diseases that are communicable to man is obviously not one of great importance, but this does not detract from the importance of sanitation and the elimination of those diseased birds. Food substances in any state of decomposition are undesirable and repulsive. They are always potentially dangerous. The consumer should be protected from having to pay for food of substandard quality, particularly unless it is labeled substandard.

The bad practices that are outlined here are not observed in general by the public, and cannot be corrected, as suggested, without public demand. If the public would demand a guarantee of wholesomeness upon the label of the food item, and supervisory agencies would demand respect for their label for wholesomeness and force industry to comply with requirements, poultry sanitation, and quality poultry products would be immediately forthcoming.

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THE PUBLIC HEALTH ASPECTS OF POULTRY INSPECTION

by

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A great deal of attention has recently been focused upon the poultry industry by members of various agencies concerned with Pure Food and Drugs, and Public Health. The preparation of ready to cook poultry is rapidly replacing the old method of marketing the so-called "New York" dressed fowl. The complete processing operation now being done in the plants demands many changes in methods and sanitary procedure. At the present time the industry is undergoing this change to the packaged, ready to cook product, and many of the problems accompanying this change have not been solved.

This paper gives a brief history of the industry for the purpose of illustrating how past production and marketing, customs influence the modern trend. A study of the processing industry was made and is reported here for the purpose of gaining information that might be useful in correcting undesirable situations that exist. The work includes observations of construction, equipment, waste disposal, pest control, disposition of diseased birds, and general sanitation in the plants and on the premises. Fraudulent practices employed by the industry are outlined. Poultry diseases that are considered communicable to man are discussed briefly with particular consideration of their significance to public health aspects in so far as poultry inspection is concerned.

The Literature Review included a study of these diseases for the purpose of determining their public health significance, and also to observe the work of others in poultry plant

sanitation.

Recommendations for improvement upon the many undesirable conditions found in the survey conclude the work. Observation and reading reveal that a great deal of work has been done to improve poultry meat products, and more work is being done, but that plenty of room for improvement remains. Large numbers of diseased poultry are being marketed, dressed under unsanitary conditions, and sold to the consumer. Only a very small part has any inspection for disease, and a great deal has no sanitary supervision. Recommendations for more rigid supervision are also included.

Methods of cooking commonly employed for poultry give a reasonable assurance of safety. It does not, however, compensate for the injustice done the consumer who unknowingly eats the products of diseased animals processed under unsanitary conditions, especially when both could have been avoided. When the public refuses to consume products of diseased poultry, then the industry will busy themselves with eliminating such diseases and relieve themselves of some unnecessary economic burdens.

