Trends in Poultry Hygiene

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THE POULTRY INDUSTRY has doubled in size since 1940, to become the third largest source of farm income. Poultry products, including eggs, have reached an annual value of approximately $4 billion at the producer level and $6 billion at the retail level. This period of rapid expansion has been accompanied by the development of widely varied practices and conditions in the poultry processing and merchandising industry.

Supermarket display cases bulge with ready-to-cook, precooked, and frozen poultry products in appetizing array, protected by colorful, eye-catching containers and packaging materials. Most of these products have been processed in large volume by production-line methods, and many have been transported long distances. Conversely, there remain numerous small poultry plants where only fresh poultry is produced, processing is accomplished with a minimum of equipment, and sales are restricted to the immediate premises or locality; in some establishments, birds may be slaughtered 1 or 2 at a time after being selected live from the coop or battery by the consumer. Also, in certain areas of the country, uneviscerated, or so-called New York-dressed, poultry carcasses are still delivered to the restaurant and hotel trade for evisceration in the kitchen and to retail markets for evisceration or for sale "as is" to the housewife.

In competition with the processing plant where the carcasses are eviscerated immediately after slaughter and removal of the feathers, and are promptly refrigerated under sanitary conditions, there is the plant where carcasses are thrown into tanks of water or ice slush and kept for evisceration later—a very insanitary and undesirable procedure. These carcasses may even be shipped to another plant or held in frozen storage for weeks or months before evisceration (*1*). In like manner, plants which operate at speeds and with procedures permitting sanitary conditions and prevention of undue contamination of product must compete with those which sacrifice sanitary considerations to the desire for speed and the highest volume possible at the lowest production cost. While some products are prepared under continuous official inspection, health, labor, and consumer groups have become increasingly concerned over the majority of plants and poultry products, which have not been subjected to such inspection.

From this many-sided picture, certain trends have emerged. These include improved sanitary procedures, improved methods of lengthening the time poultry can safely be stored, a decrease in the sale of uneviscerated poultry, increased production of ready-to-cook poultry, and an increase in official poultry regulation activities. It seems almost inevitable that these trends will continue and even accelerate in the next decade, to the benefit of all concerned. However, further study is needed of methods of determining the sanitary quality of

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poultry and poultry products, the effectiveness of specific sanitary measures, and the environmental factors which contribute to injuries and infections and their prevention in the poultry processing industry.

Improved Sanitary Facilities and Procedures

Buildings, equipment, operating procedures, waste disposal facilities, and refrigeration practices are rapidly improving in the poultry processing industry. Even in many of the smaller plants, management is learning that good sanitation is good business. Buildings and equipment especially constructed, laid out, and located for poultry processing are much more efficient and economical in operation than are old, converted premises and makeshift, insanitary equipment and facilities. Products produced under sanitary conditions have good keeping quality and are easier to merchandise effectively and consistently. Sanitary surroundings contribute to employee morale and healthier working conditions, resulting in better work performance, less labor turnover, and less absenteeism because of illness (*2*).

It has been said that one of the tragedies of life is the murder of a beautiful theory by a gang of brutal facts (Franklin). A lot of theories on poultry processing and merchandising have been murdered by facts in recent years, and this is a trend which, we can be assured, will continue. However, it is definitely not a tragedy, because the facts have opened the way to more efficient, more sanitary, and more profitable operations.

For example, the Agricultural Marketing Service, U. S. Department of Agriculture, is cooperating in detailed studies on equipment and methods used in various stages of poultry processing. A study recently completed in Georgia on packing operations led to the development of new equipment and methods which can eliminate much of the handling and labor in the ice packing of fresh poultry and speed up and coordinate the work, thus saving money and time as well as reducing opportunity for contamination of the product. Undoubtedly, forthcoming studies in other operational areas will be equally productive.

The triumph of fact over theory is not new to the poultry industry. A classic example is the theory of 20 years ago that poultry had to be merchandised uneviscerated, that is, as New York-dressed poultry, in order to ship it into large metropolitan markets and sell it before it spoiled. Another idea was that poultry could not be eviscerated commercially without contamination of the incised tissues and body cavity with fecal matter. These theories were thoroughly disproved long ago (*3*). As another example, many people believed that poultry had to be cut up on a wooden block, but the processing industry has long since learned that poultry carcasses can be suspended from a shackle or cut up on an impervious table or belt, in a manner which is just as fast and much more sanitary than the old "meatblock technique." Worth mentioning, also, is the action by U. S. Department of Agriculture inspectors encouraging removal of the liver, heart, and gizzard as the viscera hang still attached to the suspended carcass. This new procedure has accomplished its primary purpose of making possible more sanitary handling of the giblets and, at the same time, has proved to be economical and practicable in both large and small plants.

Processing operations long thought to require hand labor are now performed wholly or in large part by specially designed equipment. Minimizing personal contact with the product usually can reduce chances for contamination. Thus, the foreseeable trend toward machine boning of poultry should result in better sanitary quality of product. Unfortunately, mechanization of a particular process may not always produce happy results from a sanitation point of view; for example, present mechanized methods of defeathering poultry leave much to be desired, a situation which remains to be corrected by some future development.

Knowledge of microbiological facts pertinent to the processing of poultry products such as pies and stuffings can be used to maintain better control of refrigerating practices, ingredients, and processing operations, thereby routinely keeping bacterial counts down to levels thought impracticable of attainment a few years ago. These facts are being obtained by progressive processors through programs of research and quality control. These programs

include scheduled collections of product samples from various points along the processing line. Laboratory examination of these samples complement general sanitation supervision by identifying potential trouble spots before they develop to serious proportions. The results of these research and quality control programs may well serve as a basis for official bacterial standards in years to come.

The trend toward better sanitary facilities and procedures in the poultry processing industry will undoubtedly continue. Poultry processors are learning that the phrase "sanitation pays" is more than just a trite saying—it is a statement of fact. This has been highlighted recently by studies on various methods of prolonging the storage life of fresh poultry.

Prolonging Storage Life

For some time, new ways have been sought to extend the storage life of fresh poultry. As might be expected, the first and most essential measure has proved to be the production of sanitary ready-to-cook poultry with an initial low bacterial count. Also, unless and until a practicable method of proved safety and acceptability is developed for sterilizing raw poultry, immediate and adequate refrigeration will remain essential to long storage life.

Low Holding Temperatures, Brine Immersion

More efficient refrigeration of poultry certainly contributes to prolonged storage life. A study by the State College of Washington indicated that holding ready-to-cook poultry, after initial chilling, at 31°–32° F. rather than at 38° F. was more effective than use of certain chemicals or biologicals in the chill water (*4*).

Faster chilling and freezing of poultry is possible through brine immersion techniques (*5*). In the September 1954 issue of *Marketing Activities*, a U. S. Department of Agriculture publication, Dr. Lyle L. Davis reported:

"This method of cooling eviscerated poultry has other advantages. Packaging the product prior to cooling and combining cooling and freezing operations in one step minimizes possible contamination of birds during handling; reduces overall handling and labor costs; eliminates leaching of flavor that may take place during slush ice cooling; and provides a higher quality product with less shrinkage and better color and appearance."

Some plants utilize brine or propylene glycol immersion freezing after chilling of the unpackaged carcasses in slush ice. This would seem to nullify most of the advantages mentioned by Davis. It would also seem less desirable from the consumer viewpoint because of the considerable amount of water absorbed by the carcasses while in the slush ice, which contributes to an increased weight of product for freezing. However, there is some evidence that holding ready-to-cook turkeys for several hours in the chilled state before freezing results in a more tender product.

Antibiotics and Inplant Chlorination

Various adjuncts to refrigeration are being utilized in poultry processing. Oxytetracycline and chlortetracycline, products of two different manufacturers, have been approved by the Food and Drug Administration for use in poultry chill water, with a maximum allowable tolerance of 7 p.p.m. in the chilled raw poultry. These antibiotics can substantially extend the storage life of sanitary fresh poultry if the product is kept properly refrigerated (*6*).

Antibiotic treatment of poultry is no substitute for sanitation or refrigeration. It will not make a diseased or otherwise unfit bird suitable for human consumption, nor will it improve the sanitary quality of the product. The treatment temporarily inhibits bacterial growth when applied to a fresh, sanitary product, but it is relatively ineffective on an insanitary product or when applied after bacterial reproduction has been under way for a few days—it will not improve a spoiled or inferior product. Furthermore, refrigeration is still necessary to decrease the rate of microbial growth and other deteriorative changes.

At this time, one State (Colorado) has prohibited the sale of poultry treated with antibiotics as being in violation of the State law which provides that no preservative may be added to poultry. Also, the State of Massachusetts is not permitting the sale of antibiotic-treated poultry, pending a review and ruling on the matter by State authorities.

Inplant chlorination of the water used in

poultry processing operations at 10–20 p.p.m. has proved to be "an exceptionally effective, overall means for decreasing the bacterial counts. It lowered the counts on equipment and poultry carcasses, eliminated slime, corrosion, and plant odors, cleared corroded pipes and nozzles, and reduced cleanup time and labor by more than 33 percent" (*7*). If proper procedures are followed, inplant chlorination can be used in plants which also use the antibiotic treatment discussed above. In this regard, instructions to U. S. Department of Agriculture poultry inspection personnel (AMS PY-Instruction No. 918–10, Supplement No. 2, revised 2/13/57) on the use of antibiotics state: "When chlorinated water is used in the plant some of the poultry should be placed in the tank and should be in contact with the chlorinated water for at least 5 minutes before the stock solution of Acronize PD is added. This procedure is necessary to remove the chlorine from the water. However, this is not necessary when the antibiotic is compatible with chlorine as in the case of oxytetracycline."

Inplant chlorination extends storage life of the product by reducing initial bacterial load. It is comparatively economical and improves plant sanitation generally. Therefore, it is somewhat surprising that more processors have not taken advantage of it. This is a procedure which would be quite beneficial in both large and small plants, and it seems worthy of serious consideration as a required sanitary measure under official regulatory progams.

"New York-Dressed" on Way Out

The trend toward production of ready-to-cook poultry continues. It is estimated that only about 10 percent of poultry is now sold to the consumer in the New York-dressed, unevisceratedform. However, a substantial amount of slaughtered poultry, estimated as another 20 percent, is chilled, stored, shipped, or delivered to commercial establishments prior to actual evisceration. These practices are very objectionable from the health and sanitation viewpoint, and regulatory measures will undoubtedly be needed in some instances to completely correct this situation (*1, 8*).

Problems and Needs

In spite of the significant advances discussed above, more information is needed for an intelligent and scientific approach to the health and consumer problems associated with the processing and consumption of poultry.

Diseased Poultry

At least 26 diseases of poultry are known to cause infection in man (*9–12*). Some occur infrequently, however, and do not seem to present a significant public health problem. Others are not recognized as hazards specific to plant employees or consumers; in this latter category are eastern and western equine encephalomyelitis and St. Louis encephalitis.

Birds are believed to be the most important vertebrate hosts for viruses of these three diseases. Natural outbreaks have been observed in songbirds, ring-necked pheasants, and pigeons. Domestic fowl may have specific antibodies for the viruses and, when experimentally inoculated, chickens may develop a viremia but show no signs of illness. However, although the possibility of direct transmission cannot be ruled out, investigations indicate that these types of encephalitis are transmitted to man through insect bites.

Of the other diseases common to poultry and man, only a few have been shown to be transmitted to man from poultry, for example, salmonellosis, Newcastle disease, and psittacosis, except in rare instances. Even when no health hazard is involved, however, the consumer does not want to buy or eat food derived from or contaminated by diseased poultry, and the plant employee does not want to handle or be exposed to diseased carcasses or obnoxious materials.

Employee Health Problems

Reports to the Bureau of Labor Statistics indicate that the injury frequency rate in the poultry and small game dressing and packing industry is exceeded among 135 manufacturing industries only by the rates for logging and for sawmills and planing mills and is significantly higher than that of the red meat packing industry. The "injury frequency rate" is the number of disabling "injuries," including infections, per million man-hours worked which

result in death, permanent physical impairment, or loss of employment for a day or more. For example, if an employee contracts a skin rash but continues to work, the condition is not reported. Unfortunately, we do not have information on the frequency of specific infections or injuries, with the exception that several hundred cases of psittacosis have been reported as transmitted from poultry to man since 1948, with 137 known cases, including 4 deaths, occurring in 1956.

Injury frequency rate [1] in selected industries

Industry	1955	1956 [2]
Average for all manufacturing	12. 1	11. 9
Logging	73. 5	69. 4
Sawmills and planing mills	41. 5	41. 3
Poultry and small game: dressing and packing	34. 3	36. 7
Meatpacking and custom slaughtering	18. 9	19. 1
Sausage and other prepared meat products	20. 2	24. 0
Steel foundries	19. 9	23. 8
Construction and mining machinery	16. 5	17. 8
Blast furnaces and steel mills	4. 8	4. 5

[1] Disabling injury or infection per 1 million manhours worked resulting in absence from job of 1 day or more.
[2] Tentative.

SOURCE: Bureau of Labor Statistics Quarterly Report, June 19, 1957.

A comparison of the reported injury frequency rates of only a few industries indicates the need for studies that will more definitely delineate the problems and develop corrective measures in the poultry processing industry.

Foodborne Disease

The role of poultry in foodborne disease outbreaks is also worthy of consideration. Over 30 percent of the cases of foodborne disease reported by the States to the National Office of Vital Statistics are associated with poultry and poultry dishes. During the 10-year period, 1945–54, 31,832 of a total of 97,485 cases reported, or 32.6 percent (*13*), were attributed to the consumption of poultry; in 1955, 1,610 of 9,633 cases, or 16.7 percent; and in 1956, 3,994 of 11,133 cases, or 35.8 percent.

Domesticated poultry is a major natural reservoir of *Salmonella*. Numerous investigators have shown that poultry and poultry products carry organisms of potential food poisoning types while in the poultry processing establishment and when shipped therefrom.

It must be emphasized, however, that the contamination of poultry and poultry products may originate apart from the poultry itself, as from careless or infected plant workers or kitchen personnel, rodents, insects, sewage, unsafe water, dust, or other sources found in insanitary environments or resulting from poor food preparation practices. Epidemiological investigations of foodborne outbreaks associated with poultry and poultry products frequently fail to disclose whether the contamination originated with the bird, the environment, or the food handler. Lack of proper refrigeration before or after preparation of the food often appears to be a contributing factor.

Although other classes of perishable foods may be exposed to similar hazards of mishandling during distribution or in the kitchen, they are not so frequently associated with foodborne outbreaks as are poultry and poultry products.

Research and Investigations Needed

In view of the above, it is evident that continuing epidemiological and public health field and laboratory investigations are needed to learn more about—

1. Microbiological and chemical procedures, and possibly standards, for laboratory and field use in determining the sanitary quality of poultry and poultry products.

2. The health and consumer significance of certain commercial practices, including new processing and merchandising techniques and product treatment procedures.

3. Practical sanitary measures for preventing contamination of poultry and poultry products during processing, and the relative effectiveness of these measures for reducing the incidence of foodborne disease outbreaks associated with poultry.

4. The environmental factors which contribute to the high injury frequency rate in the poultry processing industry, the specific infections and injuries occurring, and practical preventive measures.

Nevertheless, as has been done with respect to health and consumer problems in other food industries, official agencies, while continuing the

search for new knowledge, must act on the basis of information currently available in establishing poultry inspection and sanitation safeguards.

Official Inspection and Supervision

Interested groups agree on the need for inspection of poultry for wholesomeness and sanitary supervision of poultry processing. In fact, the trend toward official poultry regulatory activities has recently accelerated to the extent that official inspection services will probably be provided to a major portion of the poultry processing industry within the next few years. These regulatory programs will not prevent all foodborne outbreaks associated with poultry or all illness among poultry plant employees. However, very definite benefits can be derived from such programs.

Control of sanitary factors in the processing and distribution of poultry (*14*), and proper antemortem and postmortem inspection of poultry for wholesomeness (*15*) can—

1. Remove from food channels poultry determined to be diseased or otherwise unfit for consumption.

2. Prevent, insofar as possible, contamination of the carcasses of healthy poultry during processing by disease matter and organisms from sick birds or by fecal matter and other wastes.

3. Within the framework of current knowledge, assure sanitary conditions and proper refrigeration within the processing establishment, proper packaging and labeling of product, and protection of product from contamination or spoilage while in distribution channels.

4. Minimize the exposure of employees to diseased poultry carcasses and wastes and exudates therefrom, and assure sanitary working conditions in clean, well-lighted, and well-ventilated surroundings.

5. Contribute to early detection of diseased poultry flocks and to the institution of treatment, segregation, vaccination, or other disease control measures, as well as to research and field investigations where indicated.

Official Services

For almost 30 years, the U. S. Department of Agriculture has provided a poultry inspection service to be used voluntarily by processors with the costs borne by them. Over 300 plants now operate wholly or partly under the department's inspection, and it is estimated that about 30 percent of poultry sold off farms was thus inspected in 1956. Over 1.4 billion pounds of ready-to-cook poultry were certified for wholesomeness. Rejected were 2,888,417 poultry carcasses, weighing 11,270,951 pounds.

The U. S. Department of Agriculture poultry inspection service has done much to improve sanitation and operational procedures in the poultry industry and to set the stage for further progress. The need of the Armed Forces for substantial amounts of inspected poultry has been a major factor in the growth of the inspection program. Firms voluntarily operating under and financing this program have also contributed toward the improvements and the progress which have resulted.

The Food and Drug Administration helps assure the wholesomeness of poultry products shipped interstate by inspecting processing plants to uncover practices which may result in shipment of adulterated poultry and by examining poultry in wholesale and retail markets.

The Food and Drug Administration recently distributed to State and local officials a Manual for the Examination and Evaluation of Poultry and Poultry Products for Compliance with the Federal Food, Drug, and Cosmetic Act (*15*). Developed jointly by the Food and Drug Administration and the Public Health Service, the manual deals with antemortem and postmortem inspection of poultry and contains recommendations on the disposition of poultry affected by various diseases and other conditions. It is expected that the manual will be given more general distribution after receipt of comments from State and local agencies.

In 1955, the Public Health Service published a recommended poultry sanitation ordinance (*14*) for voluntary use by interested State and local agencies. This ordinance was developed with the cooperation and advice of the poultry industry, professional organizations, and interested Federal, State, and local agencies (*13*, *16*). In addition, the Public Health Service has developed a motion picture and several

filmstrips as visual training aids for persons concerned with poultry inspection and sanitation (*17*). Limited research on poultry diseases transmissible to man has been conducted and participated in by the Service, particularly in connection with outbreaks of psittacosis among poultry plant workers in Texas and Oregon. The Public Health Service is providing partial financial support for research projects at the Iowa State College on the microbiology of poultry processing and of precooked frozen foods.

The Public Health Service is cooperating with the Colorado State Department of Agriculture and the Department of Health and Hospitals, City and County of Denver, in a poultry sanitation demonstration project. The purpose of the project is to study the application at the local level of the administrative and sanitation provisions of the model poultry ordinance developed by the Service. It is hoped that the experience and information gained will be helpful to other State and local agencies.

A substantial number of States and municipalities are conducting or initiating programs dealing with sanitation in the processing and distribution of poultry; several are expanding their activities to include inspection of the poultry for wholesomeness. The inspection services have been limited to voluntary programs except in California where, under the State mandatory program, actual inspection is conducted by licensed poultry plant owners or employees.

Mandatory Federal Inspection

Despite the efforts of States and municipalities, mandatory Federal inspection of poultry for wholesomeness and control of sanitation is needed in plants which process poultry for interstate commerce. The first decisive step toward such inspection was taken early in 1956, with the introduction of bills in Congress calling for a mandatory poultry inspection service to be administered by the Food and Drug Administration. Since that time, all groups concerned have testified to the need for such an inspection service, and many have advised that it be administered by the U. S. Department of Agriculture.

Five hearings have been held before congressional committees, and as a result Public Law 85–172 has been enacted by Congress. This law provides for compulsory inspection by the U. S. Department of Agriculture of poultry and poultry products processed in plants engaging in interstate and foreign commerce. It also provides authority for the Secretary of Agriculture, under certain conditions, to conduct public hearings and to designate areas of intrastate commerce to be subject to the provisions of Federal law.

State and Local Programs

Will a mandatory Federal poultry inspection program eliminate the need for State and local controls? Certainly it will make the problem much smaller. Just as certainly there will be a definite need for official regulation by the States or municipalities of processing plants which do not operate under the Federal inspection system, and of poultry and poultry products in wholesale and retail channels outside the processing plants (*8*).

More than twice as many poultry processing plants ship products only intrastate as engage in interstate commerce. A substantial quantity of poultry is processed in these plants. Official regulation by States and municipalities will be needed not only to provide protection of health and consumer interests in connection with the poultry normally processed in plants which ship only intrastate, but also because with an effective Federal poultry inspection program and concurrent absence of such a program at State and local levels, such plants might become a "dumping ground" for diseased, unfit poultry.

Presumably the Food and Drug Administration will continue its activity of checking on poultry or poultry products which have entered interstate commerce, particularly when contamination or decomposition is suspected. However, approximately 50 percent of poultry moves only intrastate, and even if it has been inspected at the time of processing, after it has left the processing plant it remains a problem for State and local agencies.

Furthermore, when disease breaks out among poultry plant employees or when foodborne disease is reported, State or local officials will still have the responsibility for making investigations and taking action to prevent repetition of these outbreaks.

Summary

Although the rapid expansion of the poultry industry has resulted in extreme contrasts in poultry processing methods, certain trends in poultry hygiene are evident.

Improved sanitary facilities, equipment, refrigeration methods, and operating procedures are being developed. New means for prolonging the storage life of poultry products are being utilized, and others are being tested. The sale of New York-dressed (uneviscerated) poultry is decreasing and the production of ready-to-cook poultry is increasing. Underway are studies designed to further the improvements in sanitary practice and operational procedures which have already contributed to more efficient and profitable industry operations. Official regulatory programs by Federal, State, and local authorities are increasing.

Research and investigations on public health and employee health problems associated with poultry and poultry processing are still needed. Nevertheless, information now available can be used to the benefit of all concerned with the further expansion of official poultry sanitation and inspection services at the Federal, State, and local levels.

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