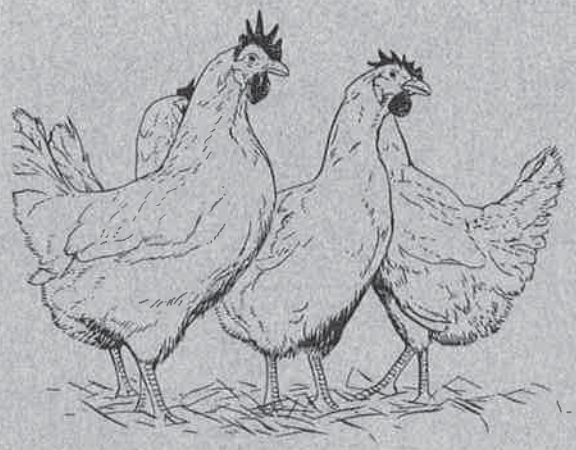
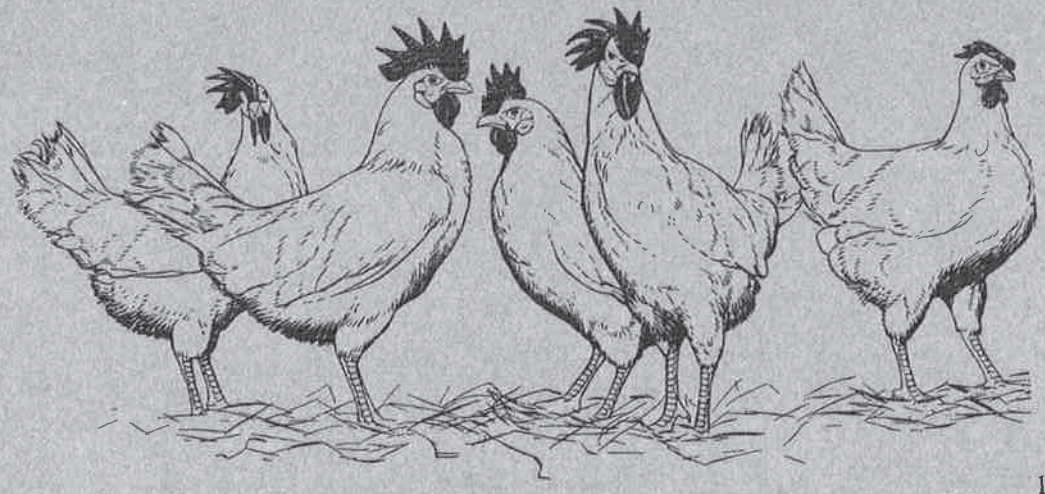


Fact Sheets



CONTRIBUTIONS OF POULTRY TO THE DEVELOPMENT OF SCIENCE

BACTERIOLOGY (study of bacteria)

Anthrax, an infectious disease which causes high fever and even death in affected animals, was a huge problem in livestock in the 1800's. Louis Pasteur (1822-1895) suggested that chickens did not get the disease because they have a high body temperature (41.5 °C). He injected a normal hen with anthrax bacteria and she lived. He injected another hen with anthrax bacteria and submerged her partially in water to lower her body temperature. The hen with the lowered body temperature died from anthrax.

Pasteur also worked with the disease known as fowl cholera. He found that if he cultured the bacterium that caused the disease (by growing it in a fluid especially prepared to nourish the cells) and gave a drop of culture to a chicken, the chicken would die. However, if he gave a drop of an OLD culture of the disease to a chicken, it exhibited a mild form of the disease and became immune (resistant) to the disease.

With this information, Pasteur was able to develop an attenuated virus vaccine against anthrax. Attenuated means that the strength of the disease-causing agent has been reduced by passing it either through animals other than the animal that normally contracts the disease or through culture. An example would be growing cattle plague bacteria in a chick embryo to make a vaccine that protected sheep from anthrax. This process also led to the work that developed vaccines against diseases such as tetanus and typhoid.

BEHAVIOR

T. Schjelderup-Ebbe (1894-1976) provided the first scientific observation of social behavior in animals in 1935. He described the ranking behavior or "peck order" that exists in a group of hens, documenting how one hen will always be dominant to all the other hens.

Konrad Lorenz (1903-1989) received the Nobel Prize for demonstrating imprinting with ducks. He showed that ducklings will identify as their parent the first object or person they see when they hatch.

BIOLOGICAL ASSAYS

It's often necessary to establish the vitamin content of various foods. A vitamin is a substance present in natural foods which is essential for good health. An animal may synthesize a vitamin in its own body; however, by definition the animal cannot make all of the vitamins it requires for good health. Since young chicks are very susceptible to vitamin deficiencies, they have been used as a biological check for chemical methods that measure the vitamin content of foods.

EMBRYOLOGY (study of formation and development of embryos)

Hieronymous Fabricius (1533-1619) pioneered the study of embryological development using the chick embryo.

ENDOCRINOLOGY (study of hormones and hormone-producing glands))

Arnold A. Berthold (1803-1861) has been called the father of endocrinolgy. In 1849, he removed the testes from one cock. The cock's comb became smaller and grew pale. When he transplanted testes into a capon (a castrated male), the bird again took on the appearance of a normal male. This was the typical sequence of events as long as the transplanted testes established a good blood supply. However, if a blood connection failed to form with the transplanted testes, the bird continued to lack the male appearance. This established the fact that the testes were producing some substance that traveled in the blood and gave the chicken its sex characteristics.

GENETICS

Johann Gregor Mendel (1822-1884), the Catholic monk known as the father of genetics, conducted his pioneering research on peas. In 1866, he described what was to become known as Medelian genetics. In 1898, William Bateson

(1861-1926), working with chickens, was the first to demonstrate that Mendel's laws applied to animals. Bateson found that both rose combs and pea combs were dominant to single combs.

GNOTOBIOTICS (study of organisms raised in germ-free conditions)

Louis Pasteur addressed the French Academy of Sciences in 1885 on the topic of "germ-free hosts." In order to study the influence of microflora (the microscopic and specialized organisms found in an animal's digestive tract) on its host, the scientist must also be able to study hosts that are germ-free. It's difficult to produce a germ-free mammal. Pasteur proposed that the chick was the most suitable model. If eggs are obtained from healthy hens, are incubated in a sterile incubator, and upon hatching are fed sterile food and water, they will be germ-free.

IMMUNOLOGY (study of mechanisms by which organisms resist and overcome infection and disease)

In 1956, Bruce Glick found that lymphocytes (a specific type of white blood cell) in the chicken's Bursa of Fabricius (the small, sack-like structure found in the cloaca of young birds) were responsible for antibody production. These lymphocytes became known as B-lymphocytes (B for bursa-derived).

VIROLOGY (study of viruses and viral diseases)

The first evidence that a virus could cause cancer came in 1911 when Francis Peyton Rous (1879-1970) discovered that the Rous sarcoma virus caused cancer in chickens. Rous won the Nobel Prize in 1966 for this work.

In 1969, A. Churchill developed a vaccine against the Marek's disease virus. This was the first control of a significant neoplastic (cancerous growth) disease in any species.

VITAMIN DISCOVERY

In 1897, Christian Eijkman (1858-1930), a Dutch physician working in Java, discovered that hens fed a diet of polished rice became paralyzed. The chickens' paralysis looked very much like the symptoms of human patients in the clinic where he worked. Humans were suffering from Beriberi (an impairment of the nerves and heart). When the birds were fed unpolished rice, they recovered. Eijkman's discovery paved the way for the whole concept of vitamins. The pioneering work of Dr. Eijkman culminated in the discovery and isolation of vitamin B1, or thiamine. This important compound was contained in the bran or outer layers of rice; the bran had been removed when the rice was polished.

In 1930, Henrik Dam (1895-1976) found that chicks fed diets very low in fat developed an illness that caused them to hemorrhage. The blood of these chicks did not clot as fast as the blood from chicks fed a normal diet. In 1935, Dam discovered that the substance needed for good blood clotting was a factor that was found in green leaves and certain vegetables. He called it the "Koagulations" vitamin; in his native Danish, "coagulation" is spelled with a "k." Therefore, the factor was named vitamin K.

Francine A. Bradley, Ph.D., Poultry Specialist,
Avian Sciences, University of California, Davis

RATITES

A **ratite** is a family of large flightless birds with a flat, keeless breastbone. The keel bone of birds of flight is important for supporting pectoral flight (breast) muscles. Although ratites are flightless, they do have small wings which they use for cooling, for balance during running, and during courtship displays. Ratites are polyphyletic, which means they have descended from more than one evolutionary line. Some ratites can be kept as companion animals and pets. Recently in the United States they have been raised for their meat, feathers, and hide as well as other products such as oil. Ratites include such birds as rheas, kiwis, cassowaries, emus, and ostriches.

RHEAS

The rhea is from the order Rheiformes and the family Rheidae. There are two rhea species: the greater rhea (*Rhea americana*) and the lesser or Darwin's rhea (*Pterocnemia pennata*). Both are native to South America. The Rhea americana is the largest bird of the Americas, and because of this, it has several nicknames, including the "American ostrich" or the "Pampas ostrich." The greater rhea lives on the pampas (plains) of Brazil, Bolivia, and Argentina. The lesser rhea is found in the Andean foothills of Peru.

The rhea has three toes, and it does not have a hind toe (hallux). Rheas have long legs and necks, and they are 4 to 5 feet tall. Unlike the ostrich, the neck of the rhea is feathered. Rheas weigh 70 to 90 pounds. The male is larger than the female, and their diet consists primarily of roots, seeds, insects, lizards, and some small mammals. The male has a harem of 6 females, and each female lays about 15 to 18 eggs. In the United States, they lay eggs from late spring until fall. The male does the incubation of the eggs, which are laid on the ground in a nest called a scrape. Incubation lasts 30 to 43 days and the male continues to tend to the chicks until they are 4 to 5 months of age. The rhea is raised for its meat, feathers, and hide.

KIWIS

The kiwi is from the order Apterygiformes and the family Apterygidae. There are three species of kiwi: the little spotted kiwi (*Apteryx oweni*), the great spotted kiwi (*Apteryx haasti*), and the brown or common kiwi (*Apteryx australis*). The kiwi is the smallest ratite and is a nocturnal bird. The kiwi is the national bird of New Zealand and is now a protected species there.

They inhabit dense forests, wetlands, swamps, and moist forested areas. Hunting and the introduction of mammals from outside New Zealand has devastated the population.

The kiwi is sometimes called the "woodcock ostrich" because it has a long, slender, curved bill with nostrils at the tip which aid in their well-developed sense of smell. They use their excellent sense of smell along with their toes, which have tough claws, for excavating earthworms (their primary diet) and other small invertebrates at night. Because they are nocturnal, they have poor eyesight but a well-developed sense of hearing. They spend much of the day underground in burrows which are lined with twigs, grass, and feathers. The kiwi has hair-like feathers, and very small wings hidden beneath these feathers, which create a sleek, contoured appearance. The kiwi is only 15 inches high, weighs anywhere from 2 to 10 pounds, and has no tail.

The kiwi lays the largest egg in relation to body size. The egg weighs 1 pound (454 grams), which is approximately 10 percent of its body weight. The female lays one or two eggs between July and February in New Zealand; in this country, they lay eggs from late fall to spring. They have both a right and left functional ovary, unlike other birds which have only a left functional ovary. The incubation is 75 to 78 days and is done by the male. When the chicks hatch, they are not fed for 6 to 12 days. Chicks are feathered at hatch and are not covered by down. The birds do not breed until the age of 5 or 6. Since kiwis are protected, they are not raised commercially.

CASSOWARIES

The cassowary belongs to the order Causuariiformes and the family Casuariidae. They are native to New Guinea and Australia. There are three different species of cassowaries. The "double wattled" cassowary is 6 feet tall and is found primarily in New Guinea and the rain forest of northeast Australia. The "single-wattle" cassowary is 5 feet tall and can be found in the coastal swamps of New Guinea, while the "dwarf" cassowary, which is only 3½ feet tall, is found in the mountain forests of New Guinea.

Cassowaries have adaptations which protect them from the dense undergrowth. For example, the feathers on their wings are only quills and are very coarse so that they are not easily damaged from the vegetation. Another adaptation is the "casque" on the top of their head, which is a flattened bony "crown" that protects the head while allowing the cassowary to part vegetation with it.

The adults have a sharp claw on the innermost toe which is used for defense. They also have thick double feathering which gives them added protection. They eat primarily fruit and leaves.

Cassowaries are monogamous, live in pairs or family parties, and each pair defends the territory during breeding season. The greenish eggs are laid from May to September in New Guinea and Australia and from late fall to early spring in this country. There are usually three to eight eggs in a clutch. The male does the incubation and brooding; the incubation period is 49 days. The cassowary is not being developed for the commercial market.

EMUS

Emus are in the order Causuariiformes and the only existing member of the family Dromaiidae. They are natives of Australia and are the second largest living bird. They stand 5 to 6 feet tall and weigh in the range of 110 to 140 pounds. The female is larger than the male. They are widespread on the Australian continent and considered a pest by some farmers because they can destroy fences while seeking cultivated crops. They have been hunted to extinction on some of the islands surrounding Australia. The emu has three toes and a bill, which is soft and broad and adapted for browsing and grazing. They feed on fruits, flowers, insects, seeds, green vegetation, caterpillars, beetles, and grasshoppers.

Each gray, hair-like feather has two identical shafts with barbs that do not interlock to form the traditional feather vane. The blue skin on the neck is not covered with feathers. The emu is a shy bird and can travel in excess of 30 m.p.h. to escape confrontations, and their long legs carry a powerful kick. Emus are also good swimmers.

The female emu lays a clutch of 9 to 12 dark green eggs and the male does all the incubation of the eggs. Each egg weighs 1 to 1½ pounds and the incubation period is 56 days. The proper incubation temperature is 91 °F. The chicks are hatched and they leave the nest after 2 to 3 days. The emu reaches sexual maturity at 2 to 3 years. They usually breed from May to August in Australia; in the United States, the emu breeds from October to May.

The emu is grown commercially for its meat, feathers, hide, and oil. The oil is used by the Australian Aborigines as a healing agent, anti-inflammatory agent, and as an analgesic (topical pain killer).

OSTRICHES

Ostriches are of the order Struthioniformes and the family Struthionidae. There is only one species of ostrich, *Struthio camelus*, "camel bird." The ostrich is the largest bird, with the adults usually reaching 6 to 8 feet in height and weighing 250 to 400 pounds. Despite their size, they can run about 40 m.p.h. Ostriches are the only ratite that have two toes, which are adapted for running and walking. They also have a very powerful kick. One toe has a long nail, which is used to lash out at predators. Although the ostrich originated in Asia, it is considered a native of Africa. There are several subspecies of *Struthio camelus*. The Arabian ostrich, which was common in the deserts of Syria and Arabia, was hunted to extinction for sport and for its plumes. The southern subspecies is found primarily in southwest Africa and Angola. There are two subspecies with red necks, the North African ostrich (*S. c. camelus*) and East African ostrich (*S. c. massalcus*), found primarily in Northern Africa. There are two blue necked ostriches, the Somali ostrich (*S. c. molybdophanes*)—found in the bush country of Kenya, Ethiopia, and Somalia—and the South African ostrich (*S. c. australis*). The Masai ostrich, another subspecies, is found in Kenya and Tanzania.

The male ostrich is larger than the female and has black body feathers with a brownish rump and white wing and tail feathers. The females have brownish-gray body feathering. Ostriches have keen eyesight. Ostriches are omnivorous. They primarily eat plants, fruits, seed, leaves, shoots, and succulents but will eat invertebrates and lizards as well.

Ostriches are polygamous; there can be one male for four or five females. The breeding season is from March to September in the United States. In the wild, the nests are shallow pits dug in sandy soil with a clutch of 12 to 36 cream-colored eggs. Commercially, ostriches are raised in pairs or trios, and each hen lays between 40 to 60 eggs. The ostrich egg is the largest egg. It weighs approximately 1.4 percent of the female's body weight at about 3 pounds, with a shell that is 2 millimeters thick. The incubation period lasts 42 days. The hen incubates the eggs during the day, while the male incubates the eggs at night. Commercially, eggs are placed in incubators. The young are precocial, and at one month of age they can run as fast as an adult.

Ostriches have been raised commercially in South Africa since 1850. The United States had a commercial ostrich industry based on the feathers until 1930, but the Great Depression and changes in fashion resulted in its demise. Recently, there has been a renewed interest in the commercial ostrich industry. Ostriches are now being raised for their feathers, meat, and hide. Ostriches are processed at 12 to 14 months of age and produce about 80 pounds of boneless meat, 15 square feet of hide, and about 3 pounds of feathers. The meat is red in color, low in fat and cholesterol, and high in protein.

Michelle A. Hall, Associate Professor,
Animal & Veterinary Science Department, Clemson University

THE COMMERCIAL POULTRY INDUSTRY

INTRODUCTION

The commercial poultry industry is divided into three main divisions, the turkey industry, the chicken meat or broiler industry, and the egg industry. The rise of the commercial chicken and egg industries began when chicken farmers decided to raise separate breeds of chickens for egg production and meat production. Today, the breed most commonly used for commercial egg production is the Single Comb White Leghorn, while the modern meat-type chicken or broiler comes from a cross between a White Plymouth Rock hen (female) and a Cornish cock (male). The turkey industry primarily uses a strain of bird called the Beltsville White.

HISTORY

The commercial broiler industry was begun in 1923 by Mrs. Cecile Steele in Sussex County, Delaware, when she started a flock of 500 chicks and sold them when they reached 2 pounds. The following year, she started 1,000 birds, and by 1926 she was producing 10,000 birds under one roof. These early broilers were actually heavy laying breeds like New Hamshires, Rhode Island Reds, Barred Plymouth Rocks, or White Plymouth Rocks.

Commercial flocks of 1,000 or more hens began appearing on the east and west coasts in the 1870's. During the 1930's, Petaluma, California, became one of the most intensive egg producing areas of the country. California produced so many eggs, which were shipped all across the country, that Petaluma became known as "The Egg Basket of the World." By the 1960's, with the promotion of contract production and an excellent transportation system for grains, much of the industry shifted to the Southeast, although California still remains one of the largest commercial egg producing states.

One could say that the turkey industry began with the first Thanksgiving in 1621, where wild turkey was served. In fact, the modern turkey industry relies upon a type of bird that owes its origins to the Broad Breasted Bronze, the White Holland, and the Beltsville White. The turkeys used by the turkey industry today are not designated by breeds or varieties but by strains such as the "large," "medium," and "small" type of hybrid white crosses. White turkeys are used because when the feathers are removed, there are no dark or black pin feathers left in the skin.

PRODUCTION AND MARKETING

In order to reach a decision to enter into poultry production, careful consideration must be given to the products being produced, types of markets available for those products, the demand for those products in the area to be serviced, and the scope of the production unit planned. The poultry industry is a vertically integrated industry. **Vertical integration** is a marketing term that means combining related marketing functions and decisions into a single firm. This means that one company controls the feed mill, hatchery, breeder flocks, growout flocks, processing, marketing, and sales of the product. Vertical integration allows for a shorter, more direct movement of the product from the farm to the table.

The poultry industry also uses a **contract production system**. In a contract production system, a grower of the birds enters into an agreement with a poultry company to provide the land, housing, utilities, and management skills required to raise broilers, turkeys, or egg producing chickens. The company owns the birds put onto the farm, provides the feed, veterinary care, and guidance to the farmer. The company also agrees to pay the farmer so much per pound of chicken or turkey meat produced or so much per dozen eggs.

Today, the commercial poultry industry produces more meat and eggs on fewer farms because of careful genetic selection, advanced nutrition programs, developments in better housing, and carefully supervised management systems. Achieving higher production levels with fewer sources is a situation known as an **economy of scale**.

CAREERS

Since the world will always need food, food industries such as the poultry industry will always be looking for well-educated individuals to carry it into the 21st century. Poultry is America's choice because of its nutritional value and because of its cost efficiency. The poultry industry is valued at over 20 billion dollars. Starting salaries for graduates in Poultry Science are competitive with other industries, beginning at $29,000.

Since the poultry industry is such big business, there is a wide variety of occupations to support it—people are needed to manage breeder farms, hatcheries, feed mills, and processing and packaging operations. Those are just a fraction of the jobs available: Consider the transportation, animal health, marketing, sales distribution, technical support, construction, maintenance, education, accounting, training, and administrative activities needed to keep the poultry industry moving ahead.

There are also allied industries that provide financing, equipment, pharmaceuticals, supplies, and services. Here are some examples of careers available in the poultry or allied industries:

Advertising/Public Relations
Bioscience/Biomedicine
Business Management
Computer Science/Data Management
Distribution/Sales/Marketing
Poultry Health/Veterinary Medicine
Food Science/Food Safety
Product Development/Quality Control
Government Agencies
Growout/Breeder Management
Home Economics
Live Production
Personnel
Pharmaceutical
Engineering
Poultry Nutrition
Genetics
Research/Teaching/Extension

Field Operations - If you feel that living and working close to nature is a rewarding way of life, you may choose a career that lets you do just that. There are many field-related jobs such as breeder manager, growout farm manager, flock supervisor, hatchery manager, or feed mill manager. Today's modern poultry production requires millions of birds and tremendous capital investment.

Research and Technical Support - If you dream of making discoveries that can change the world, then the poultry industry can be a dream come true. The results of research and scientific development are put to work in the industry almost every day. Scientists are continually studying biotechnology, genetics, nutrition, vaccines and disease control, waste recycling, environmental protection, quality control, food safety, and product development.

Sales and Marketing - If you're a creative, imaginative "people person," a form of marketing communications like advertising or public relations would be an excellent career challenge for you. The poultry industry employs sales or marketing management professionals.

Computer Science - The poultry industry also needs individuals who are familiar with computer programming, information systems, or database management. Every facet of the poultry industry is computerized—from feed mills and hatcheries to processing plants and distribution. Modern poultry houses also have sophisticated computer management systems to monitor ventilation and temperature.

Business - The poultry industry offers job opportunities in management, finance, accounting, engineering, purchasing, and personnel.

Allied Industries - A career in poultry doesn't necessarily mean you'll be working with animals. Allied industries provide supplies, products, or services to the poultry industry. Examples include jobs in the pharmaceutical industry, feed milling, equipment manufacturing and sales, distribution, government, and teaching.

The World Poultry Market - Because the poultry industry is so diverse, it's possible to find a job close to home, across the country, or around the world. To keep up with increasing consumption and expanding world demand, poultry production is growing by leaps and bounds—and so are the job opportunities.

Michelle A. Hall, Associate Professor,
Animal & Veterinary Science Department, Clemson University

THE CHANGING WORLD OF POULTRY AND EGG MARKETS

EGGS

Current trends in egg production show more eggs being produced on fewer farms. Each hen produces an average of 250 eggs per year. The protein quality of an egg is excellent, and it is used as a quality standard for all other proteins.

Per capita (per person per year) egg consumption declined dramatically in the United States between 1950 and 1990. Americans were eating 377 eggs per capita in 1950. By 1990, the consumption of eggs had dropped to 235. This amounted to a decline of roughly three eggs per capita each year. Today consumption is 255 eggs per capita.

Economists, egg producers, and food scientists have tried to explain this downward trend in egg consumption. The leading explanation offered is a change in the American lifestyle. The period between 1950 and 1990 was also a time when more women were working outside the home. Mothers were no longer cooking their families egg-and-bacon breakfasts every morning. Cereal companies increased their advertising and the variety of their products. It became more common for the average American consumer to begin the day with a cold breakfast of cereal and juice than with a hot breakfast that included eggs.

Another explanation for the drop in the number of eggs consumed was the cholesterol scare. Incomplete and sometimes inaccurate information published in the 1970's frightened some consumers into thinking that eggs and the cholesterol they contain should be avoided.

There seems to have been at least a slowing, if not an end, to the drop in egg eating by the mid-1990's in the United States. Credit for turning the consumption trend around goes to positive advertising by egg producers; new, more "egg friendly" dietary recommendations; and an increase of eggs going to the egg breaking industry. Some of the liquid egg product is going into convenience foods, such as microwaveable breakfast products. Also, fast food restaurants now serve breakfast and are using more eggs in their breakfast entrees.

Export Markets - In developing countries around the world, as individual incomes increase, egg consumption also increases. Many governments are promoting eggs as an affordable source of high quality protein for their citizens. Sometimes, expanding egg production to meet the new demand for eggs is difficult. The resources for new poultry facilities and the feed for more hens may not be readily available.

BROILERS

Current trends in the broiler industry have resulted in birds being ready for market in 42 to 45 days with an average live weight of 5 to 6 pounds. A geographic shift in production area has also occurred, with the Southeastern part of the United States growing the most broilers. Arkansas is the leading state in broiler production.

Per capita broiler consumption continues to increase every year. In 1960, per capita consumption of broilers in the United States was 23.6 pounds. Presently, that figure had increased to 82.9 pounds per person per year. By contrast, consumption of beef in the United States was 63.3 pounds per person per year in 1960, peaked at 94.2 pounds in 1976, and fell to 67.8 pounds in 1990. Today beef per capita consumption is 62.4 lbs.

Product Development - Americans have come to view chicken as both a convenience food—available in parts and in processed products such as hot dogs, battered pieces, and ready-to-cook cutlets—and as a healthy part of their diet since the meat is so high in nutrients but low in calories and fat.

Lifestyle changes have helped the broiler market. By providing quick and easily prepared chicken items, the broiler industry has met the needs of consumers who no longer wish to deal with a whole chicken. Americans are eating more and more meals away from home. The fast food industry—with products such as chicken nuggets, fingers, and wings—has become a major buyer of American broiler meat.

Export Markets - As trade develops with countries around the globe, the demand for American broilers is increasing and so is the demand for broiler parts not necessarily prized within the United States. Americans prefer white poultry meat and the breast of the broiler has traditionally been sold for a higher price than the rest of the bird. American poultry processors once had difficulty selling the less popular dark meat. With the opening of trade between the United States and the new Soviet republics, this situation has changed. Eastern Europeans tend to prefer the dark meat of thighs and drums.

Before the fall of the Berlin Wall and independence for the Eastern Bloc Countries, American leg quarters (the dark meat) sold for 18 cents per pound. In 1996, that same part of the bird was selling for 50 cents per pound, due to the tremendous demand from Eastern Europe.

Chicken feet have been a part of the bird that American poultry processors had to dispose of. The feet were sent to be rendered (water and fat removed and then the material ground down to small-particle size) and the processor received 2 cents per pound or less for the feet. American processors now have a much more profitable market for chicken feet. Consumers in Asian countries consider chicken feet a special food item. Now being marketed as "chicken paws," the feet are bringing 45 cents per pound in China.

TURKEYS

Current Trends - Like the broiler industry, the turkey industry has seen a shift in geographical location. Turkey production has shifted from the Midwest to the Southeast. The turkey industry has also gone to a year-round industry. Each turkey produces more muscle or meat on less feed resulting in one of the most efficient and economical forms of animal protein.

Per Capita Consumption - In 1960, most Americans thought about eating turkey only between November and January. Turkey was reserved for special holiday meals and the average American ate 6.3 pounds/year. Today, the average American eats 17.6 pounds per year. What happened to cause such an increase? The turkey industry was a pioneer in producing small, easy-to-handle, and quick-to-prepare meat items. The American consumer was taught that eating turkey no longer meant buying a huge bird and staying home hours to cook it. Now, products such as turkey pastrami, ham, sausage, cutlets, and ground meat are all available. Not only were they quick to prepare, they were lower in fat and less expensive than the same products made from beef or pork.

Product Development - New types of fast food outlets, those that have "complete meal replacement" menus (roast turkey, dressing, mashed potatoes, salad, and pie) could help to further increase the consumption of turkey in the United States. The overall consumption of chicken and turkey has surpassed that of beef and pork. This increase in consumption is primarily due to the nutritional value of chicken and turkey and its economical price. (See Table 26.)

Export Markets - Worldwide, turkey is also a growth meat item. The number-one foreign buyer of American turkey is Mexico. The meat is popular in Mexico because food processors can substitute turkey for pork. The Russians seem to like not just American chicken leg quarters but turkey as well. Russia is our second-largest foreign buyer.

In addition to the convenience and health benefits associated with eating chicken and turkey, poultry meat is popular in many foreign countries because there are fewer cultural taboos or religious laws against eating the meat. While Orthodox Jews and Moslems don't eat pork and Hindus who do eat meat won't eat beef, none of these people are forbidden to eat chicken or turkey.

Table 26. Poultry Nutrition Facts

	EGGS (One, 50 grams)	**CHICKEN*** (84 grams)	**TURKEY*** (84 grams)
Calories	70	200	180
Calories from Fat	40	100	70
Total Fat	4.5 grams	12 grams	8 grams
Saturated Fat	1.5 grams	3 grams	2 grams
Polyunsaturated	0.5 gram		
Monounsaturated	2.0 grams		
Cholesterol	215 milligrams	75 milligrams	70 milligrams
Sodium	65 milligrams	70 milligrams	60 milligrams
Potassium	60 milligrams		
Carbohydrate	1.0 gram		
Protein	6.0 grams	23 grams	24 grams

* Roasted, with skin

Data Source: USDA Handbook 8-5

Francine A. Bradley, Ph.D., Poultry Specialist,
Avian Sciences, University of California, Davis

BIOSECURITY

BIOSECURITY

Biosecurity is a relatively new term that includes specific steps taken to prevent disease caused by infectious agents such as viruses, bacteria, fungus, or parasites in poultry flocks. Biosecurity includes practices that keep infectious agents off of your premises through isolation rearing and reducing disease-causing agents already on your farm through proper sanitation and disinfecting practices. Biosecurity is not just for the commercial producer of poultry, it is for ALL poultry producers.

DISEASE TRANSMISSION

Disease is the departure from health and includes any condition that impairs normal body functions. Disease results from a stress which weakens the bird and reduces the bird's resistance to infectious agents. Infectious agents — such as viruses, bacteria, fungus, or parasites that cause disease in poultry — can be introduced into a flock or transmitted by:

- Birds carrying an infectious agent within the flock;
- Recently acquired birds;
- Eggs from infected breeders;
- Human hands, hair, feet/shoes, or clothes;
- Wild birds, rodents, flies, parasites, or insects;
- Contaminated feed, water, or air;
- Contaminated vaccines and medications;
- Dust, feathers, and manure on equipment and supplies, such as trucks, coops, feeders, waterers, and egg flats.

INCREASED RISK

The risk of disease increases if a) new birds are introduced into your existing flock, b) different ages of birds are raised together, c) different types of fowl are raised together, and d) new birds are placed in contact with droppings, feathers, dust, and debris from a previous flock. Infectious agents usually only survive a short time, but if maintained in the proper environment such as cold, damp, unsanitary surroundings infectious agents can survive for a long time and travel hundreds of miles while clinging to drivers, trucks, crates, or egg flats.

The table on the back of this page lists common poultry diseases, their symptoms, and the survivability of the infectious agent which causes the disease.

ENFORCING BIOSECURITY AND DISEASE PREVENTION MEASURES

"Security" is the primary emphasis of any insurance program and this holds true for biosecurity. Security entails minimizing the number of visitors on your farm. Only authorized personnel who have been provided properly sanitized footwear, coveralls, and headgear should be allowed into your poultry houses. As caretaker, you should only visit other poultry facilities when absolutely necessary and then wear properly sanitized clothing, headgear, and footwear.

It is important to isolate new birds that are brought onto the premises before introducing them into the flock. Keep free-flying birds, waterfowl and migratory birds away from your flock. Your management should include a rodent and fly control program.

Ensure proper biosecurity by keeping only one age of bird on the premises at one time. Since small flocks generally have more than one age of bird on the premises, it is important to house different ages separately. Always take care of your young birds first, then move on to your older birds. Ideally, one should not keep various types of fowl, including pet birds, on the premises. If you keep other types of animals or birds on the premises, it is important to change coveralls, head-gear, and footwear from one animal facility to the next.

To avoid transmitting disease, thoroughly clean, wash, and disinfect any equipment such as feeders, waterers, coops, or egg flats, as well as equipment that has been on another farm, on a routine basis . Included with equipment are vehicles which come onto your farm, especially those which have been at other poultry facilities. Use only plastic coops since they are easier to wash and sanitize and do not harbor bacteria like wooden crates. Do not allow dead birds to accumulate; either compost or burn dead birds. Poultry houses should be thoroughly washed and disinfected at least once a year.

Another disease prevention measure is to have good ventilation, since large amounts of fresh air reduce infectious disease agents. Always do business with companies and other farms which enforce proper biosecurity measures. Biosecurity is a worthwhile investment for any poultry producer and it is the best insurance policy money can buy.

Disease	*Symptoms*	*Infectious agent*	*Life span away from poultry*
Bursal disease	Ruffled feathers, diarrhea, trembling, prostration	Virus	Months
Coccidiosis	Diarrhea, death	Protozoa	Months
Duck enteritis	Diarrhea, death	Virus	Days
Fowl cholera	Comb and face discolored and swollen	Bacteria	Weeks
Infectious coryza	Swelling around eyes and cold symptoms	Bacteria	Days
Avian influenza	Coughing, sneezing rales, lacrimation	Virus	Weeks
Laryngotracheitis	Gasping and coughing	Virus	Days
Mareks	Paralysis	Virus	Weeks
Mycoplasma	Chronic respiratory problems	Mycoplasma	Days
Salmonella	Diarrhea	Bacteria	Weeks
Avian TB	Weight loss, death	Bacteria	Years

Michelle A. Hall, Associate Professor,
Animal & Veterinary Science Department, Clemson University

AVIAN INFLUENZA

Influenza is an acute contagious respiratory disease caused by a virus. Influenza can affect many animals such as horses, swine, and human beings. It is a disease with worldwide distribution and has been a costly disease to the poultry industry because of increases in production expenses which include extra feed, medication, additional care, quarantine measures, vaccines, cleaning and disinfection, decreases in carcass quality as well as losses of local and international trade.

Migratory waterfowl, imported pet birds, and live-bird markets are some of the sources of infection. Influenzas can be **zoonotic,** which means the disease can be transferred from animals to humans. Influenza is commonly referred to as the flu. The term "fowl plague" was used in the past when referring to avian influenza outbreaks resulting in high mortality. Today, an outbreak of avian influenza that results in high mortality is referred to as "highly pathogenic" influenza.

Avian influenza can **affect** poultry (chickens, turkeys, ducks, pheasants, geese, guinea fowl, and chukars) as well as wild birds especially sea birds (sandpipers, sanderlins, ruddy turnstones, terns, swans, shearwaters, herons, guillemots, puffins and gulls). Avian influenza is caused by any Type A influenza virus belonging to the ***Orthomyxoviridae*** family. The disease syndromes associated with avian influenza can be **subclinical** or **mild**, meaning the bird is in the early stages of the disease and the signs of the disease are not apparent, to **acute** where the signs of the disease are severe and often lead to death. Many factors influence the outcome of infection. Some factors which determine whether the disease will be subclinical or acute are the biologic characteristics of the virus, environmental stresses, such as temperature, humidity, ventilation, crowding and the age and sex of the bird.

Avian influenza can be **transmitted** via air currents, feces, humans, vehicles, water, feed, equipment, supplies, clothes, flies, litter, beetles, and other birds dead from the disease. Transmission occurs when susceptible and infected birds are in close contact with each other or when infectious material from infected birds is introduced into the susceptible bird's environment. The virus can be excreted from the respiratory tract, conjunctiva, and feces of birds. This is known as horizontal transmission. There is no evidence to indicate avian influenza is transmitted vertically, from hen into the egg. Since the virus is readily transported by people and equipment, it is important to establish strict biosecurity measures.

Once avian influenza is transmitted, the **incubation period**, the time from when the bird first comes in contact with the disease until the first signs appear, can be a few hours to 3 days and up to 14 days. The incubation period is dependent on the dose of the virus, route of exposure, the species exposed and the ability to detect the clinical signs.

The **clinical signs** for avian influenza can vary widely depending on the species of bird affected, the age of the bird, whether the bird has another infection concurrently, the strain of virus, and environmental factors. The respiratory, reproductive, digestive, or nervous systems of the bird are affected with respiratory signs being most common. The most commonly reported signs of the disease are pronounced depression, decreased activity, decreased feed consumption and emaciation, with decreased egg production and increased broodiness in hens. Respiratory signs include coughing, sneezing, rales (abnormal respiratory sounds), excessive lacrimation (tearing) from the eyes, huddling or ruffling of feathers, along with edema (accumulation of fluid) of the head and face, cyanosis (turning blue due to lack of oxygen to the tissues) of unfeathered skin (legs, combs, wattles), nervous disorders, and diarrhea. These signs may occur alone or in any combination depending on the severity of the disease. All birds in a flock will become sick (moribund) but morbidity (death) will vary from very low to 100% depending on the strain of virus, the species affected, and other environmental factors.

To determine the **causative agent** of any disease, including avian influenza, the causative agent must be identified. In the case of avian influenza, the virus must be isolated and identified. The virus can be recovered from swabbing the trachea, and/or cloaca of live or dead birds or taking samples of every organ from dead birds. Also, blood can be taken from live birds and used to demonstrate the presence of antibodies to the avian influenza virus.

There is no practical **treatment** for avian influenza. Infected flocks must be quarantined by state animal-disease regulatory agencies and procedures recommended by the National Poultry Improvement Plan (NPIP). Quarantine continues until the flock is depopulated. All buildings should be cleaned and disinfected after the poultry have gone. Poultry litter/manure should be composted before application to cultivated lands. Any treatment for avian influenza is

supportive and tries to relieve the respiratory distress. Antibiotics are not effective against viruses and are only used as supportive treatment for avian influenza to reduce the effects 'of secondary infections caused by bacteria or mycoplasmas.

Prevention is the only practical approach to avian influenza. **Biosecurity** should be the first line of defense in the prevention, and since other birds are the most likely source of infection, it is important to keep susceptible birds away from infected birds' excretions and secretions. Transmission occurs when birds are introduced to contaminated footwear, clothing, vehicles, insemination equipment, feed and water that have been exposed to avian influenza virus. The presence of the virus in fecal material is a likely means for movement by equipment and people. Another approach is serological monitoring at harvest of turkeys and chickens.

References:

Easterday, B. C., V.S. Hinshaw, and D. A Halvorson. 1997. **Diseases of Poultry**. 10th Edition. 1997. Edited by B. W. Calnek with H. John Bartnes, Charles W. Beard, Larry R. McDougald, Y. M. Saif. Iowa State University Press, Ames, Iowa. 583-605.

Schwartz, L. Dwight. 1994. **Poultry Health Handbook**. 4th Edition. The Pennsylvania State University Press. University Park, PA 41-42.