Evolution, Natural History, and Behavior

There are many breeds of domestic chicken (Gallus gallus domesticus) which have different behavior, egg production, and meat production. As there has been modification of production with selective breeding, there has also been modification of behavior. However, the extent of the behavior and needs of chicken for health is highly controversial at this time. In an experiment where battery reared hens were given a choice between an outside run and a battery cage, the birds initially preferred the familiar environment of the cage. However, a few minutes experience in an outside run was enough to persuade them that they preferred the run (Dawkins, 1980).

Evaluation of the natural history and behavior of the evolutionary ancestor of our domestic chicken allows for assessment of habitat that is required and would be less stressful for the bird.

Ranging and foraging behavior of Red Jungle Fowl (Gallus gallus)

Wide open fields are not preferred habitats for chickens. They prefer ranging areas with trees, they avoid bright sun and they tend to stay close to the house or seek tree cover (Dawkins et al., 2003). The forests where their ancestors, the junglefowl, occur frequently consist of thick clumps of bamboo separated by small clearings, so that the birds can see the approach and seek cover from predators. The main activities of free-range hens are grazing, ground pecking, ground scratching and dust-bathing. The extent of these is weather-dependent (Hughes and Dun, 1983). Semi-wild jungle fowl spend up to 60% of their time actively pecking the ground, even when not hungry, and domesticated free-range birds will spend time pecking for food even when poultry feeds are provided ad lib (Nicol and Dawkins, 1990). This may result in intoxication and impaction due to debris in the chickens’ enclosure. In free-range systems, birds are often seen to gather in flocks close to houses.

Rest and sleep

Perching, particularly at dusk, is also a strongly motivated behavior pattern. This saves many a chicken from predation. The main pattern of rest and sleep in poultry is set by the light-dark cycle. Chickens are generally inactive at night and the strength of the natural diurnal rhythm is enhanced if houses are completely dark at night. Most “lost” chicken will find their way home at dusk to roost with their flockmates and leaving the door to the coop open for the bird to enter enables this. Birds also rest during daytime, and this is normally synchronised within a group; an example of the importance of allowing social grouping in promoting natural behaviour.

Nesting behavior

In the wild, a hen usually moves away from the rest of the flock to find a secluded nesting place. Backyard flocks require nesting boxes and a nesting area which they will keep clean of feces. Chicken will choose to not lay eggs in dirty nest boxes. The nesting requirements of wild and domestic poultry are discussed by Wood-Gush (1983), who indicates that there are individual and strain differences in requirements and that choice is influenced by experience and social factors. Within the flock hierarchical structure, subordinate hens are often bullied, particularly when seeking nest boxes (Freire et al., 1998). Social factors, and the restriction of these, have an impact on the period of time a hen spends nesting.

Current poultry industrial practice does not allow chicken to perform their natural behaviors such at pecking and dust bathing. As a result the stress bacteria, Salmonella, a commensal in most species gastrointestinal tracts, is considered “endemic” in poultry houses. Salmonella is a gram negative bacillus that causes high fever and severe gastrointestinal disease in patients. Horses have classically been afflicted most commonly in hospital conditions which are stressful. The incidence of Salmonella in free range operations is approximately 1/10 of that reported in high intensity laying operations. In my opinion, this speaks to the both animal welfare and health issues. If animals are housed humanely without pain, suffering, and distress, the quality of the product will be better. While many of the industrial practices are designed to decrease disease and increase profits, they can result in alternate disease and lost production.
Chicken are a production animal and should be treated as such. Some owners do appear to want to make them house pets but this does not work well. Natural behaviors are not conducive to an indoor lifestyle.

**Nutrition**

Poultry convert feed into food products quickly and efficiently. Their high rate of productivity results in relatively high nutrient needs. Poultry require the presence of at least 38 nutrients in their diets in appropriate concentrations and balance. (See the Merck manual for detail.) Criteria used to determine the requirement for a given nutrient include growth, feed efficiency, egg production, prevention of deficiency symptoms, and quality of poultry product. These requirements assume that the nutrients are in a highly bioavailable form, and they do not include a margin of safety. Nutrient requirement may be surprisingly high until one considers the productivity of the birds. For example, meat birds require 3200kcal/kg daily and egg layers require 5% of their ingested diet to be calcium alone. Consequently, adjustments should be made based on production and bioavailability of nutrients in various feedstuffs. A margin of safety should be added based on changes in rates of feed intake due to environmental temperature or dietary energy content, genetic strain, husbandry conditions (especially the level of sanitation), and the presence of stressors including diseases and mycotoxins.

Clean water is vital and frequently difficult to provide. Impaction seems to be common in certain backyard flocks and likely revolves around substrate and lack of clean water as causative factors. Bleach tablets are sold at feed stores but are not advisable. Providing a clean water system is the best option for the birds if possible.

Calcium is obviously vital but must be balance with magnesium and phosphorus. I always add oyster shell to the layer ration provided ad libitum. This likely saved my birds lives during the Purina layer recall.

**Why do owners raise their own chicken?**

Animal welfare issues are cited by many, but owners are also raising chicken for their own health. True free-range eggs typically contain lower cholesterol, higher omega-3 fatty acids, and lower saturated fats than factory farm eggs. In these nutritional studies, “free-range” did not include farms that simply left a small door open for chickens to go in and out, or farms that did not provide sufficient range land. The legal “free-range” means that chickens may only have access to a concrete patio which precludes eating of vegetation and bugs. Therefore, health benefits of eating free range may be variable.

**Diseases**

**Vaccination**

One vaccine that is always recommended is Mareks disease but must be administered to day old chicks. Therefore, owners must buy vaccinated birds and the vaccine is only available in lots of 500 typically. Caution with other vaccines produced in China.

**Marek’s Disease (Visceral Leukosis)**

Marek's disease is characteristically a disease of young chickens but older birds can also be affected. In contrast to the lymphoid leukosis tumor response, Marek's disease may be observed in more diverse locations. Marek's disease is caused by a virus belonging to the Herpes virus group. Much is known about the transmission of the virus; however, it appears that the virus is concentrated in the feather follicles and shed in the dander (sloughed skin and feather cells). The virus has a long survival time in dander since viable virus can be isolated from houses that have been depopulated for many months. The usual mode of transmission is by aerosols containing infected dander and dust. Young birds are most susceptible to infection by Marek's disease; however, since the incubation period is short, clinical symptoms can appear much earlier than in the case with lymphoid leukosis. Marek's disease may produce a variety of clinical responses, all lymphoid in character. These are acute visceral, neural, ocular, skin or combinations of the responses that can be seen. Marek's of the visceral type is characterized by widespread involvement with lesions commonly seen in gonads, liver, spleen, kidney and occasionally heart, lungs and muscles. The disease is often acute, with apparently healthy birds dying very rapidly with massive internal tumors. The disease may appear in broiler-age birds but the most severe losses occur in replacement pullet flocks prior to onset of egg production. The neural type of Marek's is typified by progressive paralysis of the wings, legs and neck. Loss of body weight, anemia, labored respiration and diarrhea are common symptom. If lesions are present, they are confined to the nerve trunks and plexes enervating the paralyzed extremities. Frequently no gross lesions can be observed.

Ocular (eye) leukosis or "gray-eye" is usually seen in early maturity. Morbidity and mortality are usually low but may approach twenty-five percent in some flocks. It is characterized by the spotty depigmentation or diffuse graying of the iris in the eye. The pupil develops an irregular shape and fails to react to light. Emaciation diarrhea and death follow. Skin leukosis produces the most severe losses in broilers. The losses result from high condemnations at the processing plant. Enlargement of the feather follicles due to accumulations of lymphocytes is the typical lesion. This is the most infective virus since it is produced in the
regions of the feather follicles and is shed with the skin dander. Acute Marek's disease can be extremely rapid in its course, producing mortality in apparently healthy birds. However, in some cases the lesions may regress and clinically affected birds may make complete recoveries. Diagnosis is based upon flock history and disease manifestations. Accurate diagnosis depends on results of laboratory procedures. I recommend contacting your state or regional poultry lab and establishing a relationship. Batteries of PCR testing is available for nominal fees due to chicken’s agricultural status. However, be advised that reportable disease will then be reported to the state vet without your consent.

A vaccine is available that is extremely effective (90% +) in the prevention of Marek's disease. It is administered to day-old chickens as a subcutaneous injection while the birds are in the hatchery. Use of the vaccine requires strict accordance with manufacturer's recommendations in a sterile environment. There is no treatment for Marek's disease.

**Infectious Bronchitis Virus**

Infectious bronchitis is considered the most contagious of poultry diseases characterized by coughing, sneezing and rales (rattling). It is caused by a virus that is species specific. Other fowl or laboratory animals cannot be infected with this virus. Several distinct strains of the virus exist. All susceptible birds on the premises become infected, regardless of sanitary or quarantine precautions. The disease can spread through the air and can "jump” considerable distances during an active outbreak. It can also be spread by mechanical means such as on clothing, poultry crates and equipment. The disease is not egg transmitted and the virus will survive for probably no more than one week in the house when poultry are not present. It is easily destroyed by heat and ordinary disinfectants. However, carrier chicken have been documented.

Symptoms are difficult breathing, gasping, sneezing and rales. Some birds may have a slight watery nasal discharge. The disease never causes nervous symptoms. It prevails for ten to fourteen days in a flock and symptoms lasting longer than this are from some other cause, however, carrier chicken are possible. In chickens under three weeks of age, mortality may be as high as thirty or forty percent. The disease does not cause a significant mortality in birds over five weeks of age. Feed consumption decreases sharply and growth is retarded. When infectious bronchitis occurs in a laying flock, production usually drops to near zero with a few days. Four weeks or more may be required before the flock returns to production. Some flocks never regain an economical rate of lay. During an outbreak, small, soft-shelled, irregular-shaped eggs are produced.

Infectious bronchitis is difficult to differentiate from many of the other respiratory diseases. For this reason, a definite diagnosis requires a laboratory analysis.

Vaccinate chickens being retained as layers?? Whether broilers should be vaccinated depends upon many factors and is an individual decision. Numerous vaccines are available commercially. Most of them represent a modified or selected strain of the infectious bronchitis virus. The vaccine used should contain virus known to be present in the area. (How to do this in a backyard setting?) All vaccines contain live virus and those that give the best protection are also capable of producing symptoms and reducing egg production. The vaccine virus will spread to other susceptible birds. Vaccine is usually added to the drinking water, but may be dropped into the eye or nostril or used as a spray. I do not recommend this vaccination in general in backyard flocks.

There is no treatment for this disease. In young chickens it is helpful to increase the brooder temperature and provide as nearly ideal environmental conditions as possible.

**Avian Influenza**

This is a reportable disease and of importance due to government surveillance. This is rarely found in the PNW and we have not had a case of this in 5 years in our clinic. It is important that owners are aware of the zoonotic risk but I also explain that they can also contract avian influenza from their cat or ferret.

**Fowl Pox**

Transmitted directly from chicken to chicken or by mosquitoes, fowl pox is a viral disease that can be prevented by mosquito control and vaccination. The dry form of the disease is characterized by warty bumps on the face or legs. In the wet form, lesions form inside the mouth and air passages. Chickens can get both types at the same time. As this is one of the chicken diseases caused by a virus, there is no treatment.

**Lymphoid Leukosis**

Characteristically, lymphoid leukosis is a disease of adult chickens; however, the disease appears to be increasing in importance for turkeys and game birds. Although the virus of lymphoid leukosis can produce various responses (blood, bone, lymph), the lymphoid tumor response is the most common. The causative viral agent is passed out of the body of infected birds via eggs and
feces. The virus may be transmitted mechanically from infected birds to susceptibles by blood-sucking parasites or by man in such procedures as fowl pox vaccination.

Lymphoid leukosis characteristically produces lymphoid tumors, particularly in the liver and spleen as well as severe lymphocytosis (>30,000 cell/μl). The tumors may also affect other visceral organs such as ovary and lungs. Affected birds may die without preliminary symptoms, but the disease usually is chronic in nature and affected birds show loss of appetite, progressive emaciation and diarrhea. Clinically affected birds invariably die. Losses due to the disease are most severe shortly after onset of egg production, but losses will continue for as long as the flock is retained. Total loss may approach twenty percent during the life of a flock.

Clinical diagnosis of lymphoid leukosis is based upon flock history, disease manifestation, CBC, and PCR. The lymphoid disease cannot be readily distinguished from the visceral response to Marek's disease on histopathology.

There is no treatment for lymphoid leukosis. Although the disease cannot be prevented completely, there are certain steps that can be taken to help control the level of infection within a flock. Some steps are:

- Buy resistant strains of birds since genetic resistance is a deterrent,
- Brood in isolation and do not mix birds of different ages, especially through six weeks of age,
- Keep the incubator clean and disinfected,
- Control blood-sucking parasites,
- Good care, limiting stress, and adequate ration will be of benefit.

**External Parasites**

**Poultry Mites**

All classes of poultry are susceptible to mites, some of which are blood-suckers, while others burrow into the skin or live on or in the feathers. Others occur in the air passages and in the lungs, liver and other internal organs. Poultry mites retard growth, reduce egg production, lower vitality, damage plumage and may result in death. Much of the injury, consisting of constant irritation and loss of blood, is not apparent without careful examination.

The Northern Fowl Mite (*Ornithonyssus sylviarum*) is a frequent and serious pest of chickens. Heavy infestations result in poor condition and lower egg production. The mite remains on the bird and does more damage than any other species of mite. The mite does not leave the host bird, as do many species of mites, and can be observed on birds in large numbers during daylight hours. It prefers the feathers below the vent and around the tail, but can be found on all parts of the body. The mite is extremely small and a microscope or magnifying glass may be needed to see it. The female northern fowl mite lays eggs on feathers where the young mites complete their development without leaving the host. Since they remain on the fowl most of the time, treatment of the birds is necessary to destroy the mites.

The Common Chicken Mite (*Dermanyssus gallinae*) is the most common mite found on all types of poultry. It is a blood-sucker, and when present in large numbers, loss of blood and irritation may be sufficient to cause anemia. Egg production is seriously reduced. This mite feeds at night, and usually remains hidden in cracks and crevices during the day. It attacks birds at night while they are on the roost. In heavy infestations, some mites may remain on the birds during the day. About a day after feeding, the female lays eggs in cracks and crevices of the house. The eggs hatch and the mites develop into adults within about a week. During cold weather, the cycle is slower. A poultry house remains infested four to five months after birds are removed. Since the mite feeds on wild birds, these birds may be responsible for spreading infestations. However, it is more likely that spread of the mite is promoted by using contaminated coops. Human carriers are also important. Since these mites do not stay on the birds during the day, apply treatments to houses and equipment as well as the birds.

The Scaly-Leg Mite (*Knemidocoptes mutans*) lives under the scales on feet and legs of poultry. It also may attach to the comb and wattles. It causes a thickening of scales on the feet and legs that gives the impression that the scales are protruding directly outward, rather that laying flat on the limb. It spends its entire life cycle on the birds and spreads mainly by direct contact.

The Depluming Mite (*Knemidocoptes laevis*, variety gallinae) causes severe irritation by burrowing into the skin near the bases of feathers and frequently causes feathers to be pulled out or broken. The mite is barely visible to the naked eye and can be found in follicles at the base of the feathers. The mites crawl around the birds at times, spreading from bird to bird.
The most effective treatment for all mite species is a regular inspection and spraying program of both the birds and their premises. An appropriate solution of permethrin, when sprayed on the birds, will eliminate all mites that infest the bird. The spraying of all facilities will ensure that any mites hiding in cracks and crevices will be destroyed. The treatment should be repeated on a one to two month schedule or whenever populations of the mites are detected.

**Poultry Lice**

The primary effects of lice on their hosts are the irritations they cause. The birds become restless and do not feed or sleep well. They may injure themselves or damage their feathers by pecking or scratching areas irritated by lice. Body weight and egg production may drop. All lice infecting poultry and birds are the chewing type. Mites may be confused with lice, but mites suck blood. In general, each species of louse is confined to a particular kind of poultry, although some may pass from one kind to another when birds are closely associated. Chickens usually are infested with one or more of seven different species; turkeys have three common species.

All species of poultry lice have certain common habits. All live continuously on feathered hosts and soon die if removed. The eggs are attached to the feathers. Young lice resemble adults except in color and size. Lice differ in preferred locations on the host, and these preferences have given rise to the common names applied to various species. In general, the incubation period of lice eggs is four to seven days, and development of the lice between hatching and the adult stage requires about twenty-one days. Mating takes place on the fowl, and egg laying begins two to three days after lice mature. The number of eggs probably ranges from fifty to three-hundred per female louse.

As the name suggests, the Head Louse (*Cuculogaster heterographa*) is found mainly on the head, although it occurs occasionally on the neck and elsewhere. It usually is located near the skin in the down or at the base of the feathers on the top and back of the head and beneath the beak. In fact, the head of the louse often is found so close to the skin that poultrymen may think it is attached to the skin or is sucking blood. Although it does not suck blood, the head louse is very irritating and ranks first among lice as a pest of young chickens and turkeys. Heavily infested chicks soon become droopy and weak and may die before they are a month old. When the chickens become fairly well feathered, head lice decrease but may increase again when the fowls reach maturity. This louse is oblong, grayish and about 1/10-inch long. The pearly-white eggs are attached singly to the down or at the base of the small feathers on the head. They hatch within five days into minute, pale, translucent lice resembling adults in shape.

The Body Louse (*Menacanthus stramineus*) of chickens prefers to stay on the skin rather than on the feathers. It chooses parts of the body that are not densely feathered, such as the area below the vent. In heavy infestations, it may be found on the breast, under the wings and on other parts of the body, including the head. When the feathers are parted, straw-colored body lice may be seen running rapidly on the skin in search of cover. Eggs are deposited in clusters near the base of small feathers, particularly below the vent, or in young fowls, frequently on the head or throat. Eggs hatch in about a week and lice reach maturity within twenty days. This is the most common louse infesting grown chickens. When present in large numbers, the skin is irritated greatly and scabs may result, especially below the vent.

The Shaft Louse or small body louse (*Menopon gallinae*) is similar in appearance to the body louse, but smaller. It has a habit of resting on the body feather shafts of chickens where it may be seen running rapidly toward the body when feathers are parted suddenly. Sometimes as many as a dozen lice may be seen scurrying down a feather shaft. Since the shaft louse apparently feeds on parts of the feathers, it is found in limited numbers on turkeys, guinea fowl and ducks kept in close association with chickens. It does not infest young birds until they become well feathered.

The same control measures used to eliminate mite populations is effective for treating lice. It is more important to apply the insecticides directly to the bird's body rather than the premises.

**Fowl Tick (Blue Bug)**

The Fowl Tick (*Argas persicus*) may be a serious parasite of poultry if it becomes numerous in poultry houses or on poultry ranges. The tick is a blood-sucker, and when present in large numbers it results in weakened birds, reduced egg production, emaciation and even death. The fowl tick is found throughout most of the South and is extremely hardy. Ticks have been kept alive without food for more than three years. The ticks will feed on all fowl. Fowl ticks spend most of their lives in cracks and hiding places, emerging at night to take a blood meal. Mating takes place in the hiding areas. A few days after feeding, the female lays a batch of eggs. In warm weather the eggs hatch within fourteen days. In cold weather they may take up to three months to hatch. Larvae that hatch from the eggs crawl around until they find a host fowl.
They remain attached to the birds for three to ten days. After leaving the birds they find hiding places and molt before seeking another blood meal. This is followed by additional moltings and blood meals.

Ticks are difficult to eradicate and methods employed must be performed carefully. It is not necessary to treat the birds, but houses and surrounding areas must be treated thoroughly.

Control of External Parasites

There are many insecticides available to help control external poultry parasites. The most effective broad spectrum insecticide is permethrin. Permethrin has a significant residual activity, thus making it ideal for treating facilities and equipment. At reduced concentrations it can be applied to the bird. Follow all manufacturers recommendations when using all insecticides.

Predation

While the old adage about keeping the fox out of the henhouse may apply and still be an issue in some regions of the country, the most common predator of backyard flocks in the US is the raccoon. If raccoons are endemic they may not only steal all the eggs but also kill all the chicken typically by tearing off legs and heads. Raccoons typically strike at night so having real locks on doors and ALWAYS locking birds in a completely sealed coop with a roost at night can prevent this predation. Leaving a dog in the yard is also a deterrent but raccoon trauma may occur to the dog. Treat any traumatic wounding in a standard fashion. Feral cats will also attack chicken and may wipe out flocks. Similar prevention is warranted and cats may be trapped and taken to local shelters.