



**A Report On
Broiler Chickens**

BALANCING PRODUCTION AND WELFARE

Complex Animal Care Issues

April 2003

**By
Jackie Wepruk, Faunus Consulting
for
Susan Church, Manager
Alberta Farm Animal Care (AFAC) Association
Phone: (403) 932-8050
www.afac.ab.ca**

Table of Contents

I. Introduction	3
II. Leg Abnormalities	3
III. Ascites	5
IV. Sudden Death Syndrome (SDS)	5
V. Chronic Hunger	6
VI. Rooster Aggression	7
VII. The Future of Broiler Production	8

I. INTRODUCTION

Broiler chickens have been selected for fast growth and efficient feed conversion. In 1976 it took 63 days for a broiler to reach a market weight of 2 kilos. In 2001 it took just 35 days. Improved growth and feed efficiency has resulted in:

- Birds make better use of feed materials, thereby reducing waste;
- Poultry meat is more affordable.

However, fast growth rates have been blamed for a host of broiler welfare concerns. The broiler industry has attempted to address these concerns through genetic selection and careful management strategies. Modern broilers require exceptional management to ensure bird health. “Birds are sensitive due to genetic selection for increased yields,” says Detlef Onderka an Alberta poultry pathologist. Dr. Joy Mench, Department of Animal Science University of California suggests, “One might want to ask ... is it acceptable to breed (or grow) a bird that has to be so carefully managed to stay healthy.”

However, through careful management, plant condemnation rates (an indicator of bird health and well-being) have been reduced over the years, says Don Sungaard, an Alberta chicken producer.

II. LEG ABNORMALITIES

Leg abnormalities were a serious issue in the 1980's, but many feel the issue has largely been addressed through genetic selection for leg health and improved management strategies (e.g., lighting programs). Dr. Frank Robinson, poultry researcher at the University of Alberta, says, “primary breeders have done a great job of reducing the incidence of leg problems over the years.” Dr. Mench suggests, “Fewer birds have to be culled for skeletal problems, but they still don't walk well.” She adds, “The incidence of leg disorders from one flock to another is very variable, indicating that management has an important influence on leg problems. Current research in Scandinavia indicates that the problems are of about the same magnitude and frequency as they were ten years ago, although improvable with some management changes.”

Jim McKay, a spokesperson for Aviagen a primary breeding company, explains that genetic selection for leg health must be combined with good management strategies. Leg disorders can also be caused by bacterial infections (e.g., femoral head necrosis), illustrating the need for good husbandry practices. Lighting programs are also an essential element of good management. “Producers have moved away from 23 or 24 hour lighting,” says McKay. Intermittent dark periods reduce mortality, slow down early growth rates and decrease potential pain caused by leg disorders.

Dr. Ian Duncan, Department of Animal and Poultry Science, University of Guelph has studied the natural brooding rhythms of hens with chicks. “Chicks normally have periods of activity interspersed with periods when they huddle under the hen to keep warm,” he says. Duncan believes that, as well as regulating temperature, these quiet periods are very important in allowing chicks to rest. Switching the lights off and on every 40 minutes can simulate brooding patterns, and broiler chicks do extremely well under these conditions. Duncan believes that the poultry industry needs to promote the naturalness of intermittent lighting programs. “Telling the public that we are simulating natural brooding cycles is likely to be much more acceptable than saying, ‘We are keeping birds on

an intermittent lighting program to reduce growth early on.’ This is likely to be seen as another negative imposition on the birds.”

Dr. Lloyd Weber, a private poultry pathologist in Ontario, notes that leg problems are not an issue with female broilers. Males are more likely to exhibit leg problems because they tend to grow faster and larger. However, the incidence of leg problems, even in males, has been reduced significantly since the 1980’s. Dr. Weber believes this is due to:

- Selection for genetic health, not just for fast growth;
- Better management strategies, particularly lighting programs;
- Better nutrition in poultry rations.

In addition Dr. Weber notes that daily culling needs to happen to ensure the health of the flock. “Unfortunately, producers are sometimes reluctant to cull poor birds,” he says.

Dr. Hank Classen, poultry researcher at the University of Saskatchewan agrees that the incidence of leg problems has come down. “Valgus/varus deformities (the most important leg problem at one time) and TD have virtually disappeared, and overall bird mobility is improved. The reality is that leg problems will likely never be totally abolished in rapidly growing birds. However, I truly believe that rapid growth is not automatically associated with leg disorders and that at least some of the primary breeders have developed good techniques to minimize these problems.”

Gait scores are often used to assess bird mobility. Much of the debate surrounding correct broiler conformation and movement relates to gait scores. Dr. Classen says,

It is a valuable technique but is subjective and therefore its use will vary from location to location. Defining ‘normal’ gait is a particular problem. I do not think comparing broiler gait to a White Leghorn is appropriate. Broilers are very different, their conformation has changed and therefore normal for this bird is likely different than the White Leghorn. Similar differences in gait can be seen for a wide range of animals (dogs, cattle, etc.). Is this a welfare concern? I have not seen enough scientific evidence to tell me whether it is or not. Undoubtedly high gait scores are an animal welfare concern and I would argue that these have decreased in recent years. Whether a lower gait score (but higher than a White Leghorn) is an animal welfare concern needs further work.

Dr. Duncan feels there are indicators, other than gait scores, which suggest that leg health is not what it might be. He says, “The fact that broilers do not use perches (if perches are provided) after 3-4 weeks of age whereas other domestic fowl are keen to use perches, is suspicious. This leads to broilers resting in ‘abnormal’ postures on the litter and probably contributes to hock burn and breast blisters.” He also points to a study in Bristol by Danbury et al, (published in *The Veterinary Record*, March 11, 2000), which showed that broilers will self-medicate themselves with painkillers, as suggestive that leg health is not optimal. In the study sound birds with a gait score of 0 were compared with moderately lame birds with a gait score of 3. Lame birds preferentially selected food containing analgesics, suggesting that chronic lameness is painful. Sound birds avoided the drugged feed. In a second experiment lame birds again selected more drugged feed than sound birds, but also the amount of drugged feed increased with the severity of lameness. The researchers suggest this finding may indicate that as lameness becomes more disabling, birds may suffer more pain.

III. ASCITES

Ascites is a heritable condition related to fast growth. Birds cannot keep up with their metabolic demands for oxygen, resulting in high blood pressure, over-development and swelling of the right ventricle and fluid accumulation in the abdominal cavity. The condition is recognized as a serious economic and welfare concern.

Dr. Weber notes that ascites tends to be a male broiler problem, but that the incidence is being reduced. "Slowing down growth rates in the first two weeks and good ventilation in barns is important." He also notes, "the most important job we are doing is brooding chicks at warmer temperatures than 80°F. The temperature of the litter should be between 90-92°F as chicks cannot regulate their internal temperature well at under one week of age." Lower temperatures can have long-term effects on chicks. Higher altitudes also tend to produce increased incidences of ascites.

Jim McKay says that ascites has been reduced in Aviagen birds.

We have selected birds at high altitude (2000 metres) in South Africa for many years. From this we have learned a lot about the physiology of rapid growth in limiting oxygen supply. We have used this to make better selections at low altitude using physiological measures of heart and lung function. In this way we have reduced the susceptibility of our birds to ascites. There will still be some cases of ascites because it has many possible causes. For example restricted airflow in hatchers, dusty environments, diseases that damage the lungs can all cause ascites. We cannot avoid all possible causes of ascites but I hope that our management advice and our genetics minimize the impact on welfare. A few years ago we were told that if chickens grew faster they would have higher and higher levels of ascites. We have proved that claim wrong.

He also states, "if the levels of ascites and skeletal disease were simply dictated by growth rate then, all breeds growing at the same rate would have the same level of problems. This is clearly not true and demonstrates the efficacy of our selection programme."

IV. SUDDEN DEATH SYNDROME (SDS)

SDS is not well understood. Birds die suddenly from cardiomyopathy (enlarged heart). There is no genetic relationship between ascites and SDS according to Jim McKay, but the condition is a phenomenon of fast growth. SDS has been a persistent problem, as it has a lower heritability. Dr. Classen notes, "SDS has been difficult to eliminate, but I would also add that from my research experience it has not gone up despite much more rapid growth rates in modern birds."

From a welfare perspective SDS has received less attention, possibly due to the fact that death comes quickly and without warning, so birds are not perceived to suffer.

V. CHRONIC HUNGER

Chronic hunger in broiler breeders is a contentious issue. Broiler chickens have been selected for increased appetites to promote fast growth. The parent stocks have the same large appetites but must be feed restricted in order to ensure reproductive abilities.

Dr. Duncan, says, “If the birds are fed to appetite, they will become obese and long-term welfare will be reduced; if they are restricted, then they show symptoms of hunger and distress.” Dr. Robinson says, “While fitness is increased in feed restricted birds, there is no question that feed restriction increases stereotypies. But they [the birds] vocalize pleasantly, they chase flies, and they can jump around and mate. None of these things are possibilities for full-fed birds”

Jim McKay maintains that feed restricted birds are more mobile, active and healthy. Management techniques, such as dilution, skip-a-day feeding and environmental enrichment, can mitigate hunger. He says, “Birds in normal production systems do not show the same degree of stereotypic behavior as in experimental conditions. Genuine work is needed to address differences between experimental and normal commercial environments. Social groups are important, as is the opportunity to express normal behavior.”

Dr. Duncan suggests, “Just because birds can be kept healthy and live longer if they are severely food-restricted that does not ensure good welfare. The fault lies in producing strains of animals that have completely unnatural appetites and so cannot be kept under normal conditions.”

Research by Dr. John Savory indicates that feed restricted broiler breeders are chronically hungry. In his study, birds were required to work for their food by pecking at a key. Pecking behavior was used as a measure of feeding motivation. Feed restricted broiler breeder females were approximately four times more motivated to access food than fully fed birds subjected to feed withdrawal for 72 hours.

Dr. Robinson and Dr. Rob Renema note in a paper entitled, “Reproductive Implications of Full-Feeding Female Meat-Type Poultry Parent Stocks,” that ad libitum feeding, “can set up the bird for a lifetime of obesity, discomfort, leg-joint strain, poor vigor, and poor control over ovarian follicle production and release ... the well being of the birds may make feed restriction programs the more welfare friendly alternative.” They add, “Ideally, geneticists and physiologists need to combine to identify the factors linking growth and reproduction, and produce a bird capable of growing quickly while sustaining reproduction without the need for substantial feed and [body weight] restriction.”

In addition they comment:

The need for refinements to restriction programs is becoming increasingly important with the development of high breast-yield strains, and with continued increases in the growth potential at the expense of reproductive potential. Selection for broiler breeder egg production is not as heritable or profitable as selection for growth traits, however. As a result, Whitehead (2000) indicates that geneticists continually compound the problem by breeding a bird that, if allowed to exist in its freely expressed state, is completely unfit for life.

Dr. Robinson says, “You have to work with us for a day and see this to not take this lightly. Mortality in the full fed birds is in the range of 20 – 30%. They have bumble foot (even in floor pens); they cannot jump up to nests or perches (2 feet). They die while being weighed and have high levels of internal ovulation.”

Research is showing that broiler breeders may not need to be restricted throughout their lives. Reproductive performance is maximized when birds are restricted between 7 and 15 weeks of age. Dr. Robinson has found that by 30 weeks of age, ad libitum fed birds consume about the same amount as feed restricted birds. He poses possible reasons for this:

- Ad libitum fed birds are usually quite sick by 30 weeks of age, so this may decrease appetite;
- Ad libitum fed birds are not laying as well, so they may not have the same feed requirements;
- A set point for weight has been reached.

Dr. Robinson adds, “I agree that feed restriction is not an animal welfare friendly alternative. But, what choice do we have?” The economic and genetic shift that would be required to market broilers hatched from less restricted hens would be significant. Are we willing, consumers especially, to bear the costs that these changes would require?

VI. ROOSTER AGGRESSION

Studies by Dr. Duncan, Suzanne Millman and Dr. Tina Widowski have found that “most broiler breeder males of various strains are very aggressive toward females.” Females are being harassed, injured and even killed by males. According to Dr. Duncan, “Broiler breeder males are deficient in certain elements of courtship behavior.” He believes that this high level of aggression is genetically based. While not directly related to fast growth, it is suspected that male aggressiveness towards females may be correlated with the selection for production traits.

Jim McKay says, “Variation in mating behaviour is not unique to chickens. The ratio of males to females needs to be right.” This is a management issue where producers need to optimize behavior through management. The social context and relative body weights of males to females is very important.

George Wickersham, an Alberta broiler hatching egg producer has not had concerns with rooster aggression. “We have one male per fourteen females with no problems. We would have a problem with male to female aggression if the male numbers were too high.” Males are toe-trimmed* at one day of age and beak-trimmed to further minimize potential damage to females.

Dr. Duncan’s experience has been different. “All the [producers] I have visited say it [rooster aggression] is the most pressing problem today ... we started work on this problem because we were begged to by producers who were losing many females through injuries caused by aggressive males. It is true that increasing the sex ratio of females to males gives a little control – but I would argue that this is just a band-aid solution. Males should not be showing ANY aggression towards females. It is a completely abnormal response. Male domestic fowl dominate females passively and seldom show any overt aggression toward them.”

* Males often have the tip of the third phalanx removed from the inside toe or the two inside toes with a hot blade so that they cause less damage to the hen when mounting her in adulthood (Duncan, 2001).

In Dr. Duncan's studies courtship and mating behavior in commercial broiler breeder males was compared with commercial laying strain males and game strain males (birds bred for cock-fighting and hence aggressiveness). While the ratio of males to females was high in these studies (one male to three females), they were consistent between groups. It is interesting to note that none of the birds were toe-trimmed (except for one batch of broiler breeder males in one study). At one week of age all chicks were beak-trimmed, except for the game strain males. However, of injuries incurred by females, broiler breeder males were predominantly responsible.

Dr. Robinson has not heard the issue of rooster aggression brought up at broiler breeder talks he has attended in the last five years. He feels the males are mating too much to fight. However, he questions why flocks must be 'spiked' to get males to last long enough. "Is it right that males burn out after 20 weeks in the barn with hens?"

VII. THE FUTURE OF BROILER PRODUCTION

Can genetic and management solutions be found for these issues, while continuing to increase broiler productivity? Dr. Mench says, "I don't think the problems are solvable, only that we can minimize them through genetic selection and good management."

Dr. Robinson says, "Selection for fast growth will run into a ceiling eventually. Our breeding system is short-sighted and not sustainable." Dr. Duncan adds, "We are reaching the biological limit of growth and it is a mistake to think we can go on and on selecting for increased growth rate without costs to the bird. It also is a mistake to think that we somehow can find an environmental or nutritional solution to these problems. The long-term solution will be a genetic one." Dr. Classen questions, "Who will make the decision on the maximum growth rate and on what basis?"

Dr. Robinson also wonders if heavy selection for production traits will be the end of the industry, as we are losing genetic variation, and he worries about birds being in the state they are in. However, he plants the responsibility for change in the hands of consumers. "Consumers need to accept that food may cost more for slower growing birds." Dr. Mench agrees, "This is part of the larger market demand for a bird with lots of breast meat that can be produced as cheaply as possible."

Dr. Onderka believes we have to offer alternatives if we are to criticize the system. "It is very hard on producers, as they have a lot of management dictated to them. Our collective wisdom should help producers improve welfare." Dr. Robinson adds, "We need continued input from poultry geneticists to have balanced selection."

Dr. Classen muses, "Has the welfare of broilers been compromised in the last 30 years? Probably. However, at least some primary breeders have seen the problem and developed more sophisticated selection procedures that have reduced the level of leg disorders, and more recently ascites. Progress has been made."