

What Causes Footpad Dermatitis in Poultry?

Good litter management and proper ventilation are critical to preventing footpad dermatitis (FPD) and maintaining health in poultry flocks. **Footpad dermatitis first became an issue for the poultry industry in the 1980s**, but it surely existed long before that time. The condition is known by a variety of names, including pododermatitis and contact dermatitis. It is characterized by inflammation and ulcers on the footpad and toes. The sores can be shallow or deep. Deep ulcers may lead to abscesses of the underlying tissue and structures (Greene et al., 1985). For many years, the feet (or “paws”) of broiler chickens received little attention, but that all changed during the 1980s. Until then, chicken paws were not a saleable product and were rendered along with blood, feathers, and other unmarketable parts of the chicken. However, in the mid-1980s, an overseas market for broiler paws began to develop, and paw quality became more important. A chicken “paw” is actually the portion of the leg below the spur; a chicken foot includes the foot as well as the portion of the leg below the feather line.

The **continuing demand for paws** in the overseas market has turned the feet into the third most valuable part of the chicken, behind the breast and wings. Because of this, lesions caused by FPD are a major concern to the poultry industry. Lesions can harm animal welfare, product quality, and food safety (Shepherd and Fairchild, 2010). Under the right conditions, **FPD lesions can develop in less than a week**. The first signs are discoloration of the skin that may develop into ulcers. The ulcers can cause swelling, red-

ness, and heat under the skin and cause the surface area to thicken (Meluzzi et al., 2008). Often, a scab or crust will cover the lesion. If severe ulcers develop, they may cause pain, decrease growth rate, interfere with walking, and provide an entry for bacteria. Therefore, the National Chicken Council (NCC) uses footpad lesions and paw scores when they assess the welfare of poultry flocks in the U.S. (NCC, 2010).

Major Factors

Several major factors are associated with the occurrence of FPD. These include drinker design and management; diet composition; house temperature and humidity levels; litter type, quality, and quantity; and gut health. Of these, **litter may be the most important** because footpads are in constant contact with the material on the floor. In the absence of wet litter, FPD may not develop even though other factors may be present. However, it has been reported that wet litter (i.e., litter that is more than 30 percent moisture) is associated with increased incidence and severity of FPD in broiler and turkey housing systems (Martland, 1984; 1985).

Drinker System

The design of your drinker system and how you manage it will play a major role in the moisture content of the litter and the level of FPD your flock may experience. Waterline height and water pressure must be managed correctly to prevent wet floors and maintain performance. Line height that is too low or pressure set too high will lead to wet floors. Line height that is too high or pressure set too low will



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restrict water intake and thus feed intake and growth rate. Water quality is also important because water that contains lots of particles or has a film will cause nipples to leak, resulting in wetter floors. Most integrators have a water sanitation program in place that their growers follow. Depending on the quality of your water, this program alone may or may not be adequate for your particular operation.

Diet and Nutrition

Along with wet litter, nutrition and diet composition are considered major factors in the onset of FPD. Jensen et al. (1970) reported the incidence of dermatitis was high in young turkeys that ate high levels of soybean meal. Soybean meal has been investigated as a possible cause of FPD because **indigestible carbohydrates** (non-starch polysaccharides, or **NSP**) in soybeans and other plants may be sticky and caustic (Hess et al., 2004). As NSP in the diet increase, gut viscosity increases, resulting in manure that sticks to the footpads of the birds (Shepherd and Fairchild, 2010). This sticky manure causes litter to cling to the foot, so corrosive substances in the litter stay on the foot longer. Commercially available enzymes can be used to help address diets higher in NSP.

Other feed ingredients can also affect FPD. Modern broilers are very responsive to nutrient density in the diet, so maximizing nutrient density in feed is an important way to maximize profit (Bilgili et al., 2010). However, research has shown that feeds with high nutrient density, high protein levels, and high soybean meal levels can lead to increased levels of FPD in broilers (Nagaraj et al., 2007). Therefore, feeds should have optimum amino acid density but minimum crude protein levels, which can be achieved using digestible and synthetic amino acids (Bilgili et al., 2010).

Another factor that can contribute to FPD is litter friability (Eichner et al., 2007). Litter should be loose (friable) because chickens tend to scratch, peck, and work the litter material, which improves aeration, speeds up drying, and reduces particle size. As litter becomes damp, it cakes, and birds cannot work the litter. As the birds walk and rest on wet, caked litter, the outer layers of their skin begin to soften, similar to the way our fingertips become soft and wrinkled when they have been in water for too long. The caked litter produces friction between the soft footpad and the floor; the outer skin layers erode and can cause an FPD lesion (Fairchild and Czarick, 2011).

Temperature and Humidity

Temperature, humidity, and ventilation play an important role in keeping litter dry and reducing the incidence of FPD. While FPD can occur on relatively dry litter, it is usually associated with damp, wet, and

caked litter. Ventilation helps keep litter dry.

However, ventilation during winter is especially challenging. Because it is expensive to heat the house while ventilating with cold outside air. Growers often choose to conserve heat by sacrificing proper ventilation during cold months, making wet litter more likely. For this reason, **winter is a critical period for FPD incidence**. In contrast, increased ventilation during warmer weather helps control moisture and prevents wet litter.

Regardless of the season, house relative humidity (**RH**) levels should be in the 50-70 percent range. If RH is below 50 percent, litter becomes too dry and dust levels increase. If RH remains above 70 percent for too long, litter slicks over and cake forms.

Stocking Density

The relationship between stocking density and FPD is unclear. Some studies report that higher stocking densities are associated with a greater incidence of FPD, but other studies suggest stocking density is not a factor. It is difficult to keep up with the increased moisture removal demands caused by additional birds in the house, but many growers do a good job of it, even during colder weather. Although having more birds in the house makes litter quality harder to manage, it has been concluded that stocking density itself has little effect on FPD as long as adequate house environmental conditions are maintained (Dawkins et al., 2004). In other words, if growers ventilate correctly and keep the litter dry, **higher stocking densities do not automatically result in FPD issues**.

Litter

The type, quality, and quantity of litter can affect the rate of FPD. Sawdust, rice hulls, and peanut hulls are all acceptable bedding materials for poultry houses; however, kiln-dried pine shavings are usually the material of choice where they are available and priced right. Several factors drive the choice of bedding material, including moisture absorbance, cost, availability, and particle size. Particle size is especially important; smaller particles absorb and release moisture more rapidly than larger particles. Larger particles tend to cake over more quickly and hold moisture in. Litter that is at least 4 inches deep has a large absorbing capacity, which helps minimize FPD. However, litter must be kept dry to maintain paw quality.

The **litter is like a big sponge** that soaks up moisture in the house. Proper ventilation removes excess moisture and prevents this "sponge" from becoming saturated and forming caked litter. Meluzzi et al. (2008) reported that controlling environmental conditions, especially litter quality, appeared to be the best way to control the onset of FPD. A poorly managed

ventilation program, including less-than-adequate air flow or cold air chilling the floor, allows excess moisture to build until it results in cake. Other factors also contribute to damp litter, such as condensation forming on the walls due to lack of insulation or air leakage at the doors, footings, or other areas; downtime between flocks; poor drinker management; evaporative and fogger-based cooling systems; and weak intestinal health programs (Cengiz et al., 2011). By the time you see caked litter, you are losing control of your ventilation program and are facing an uphill battle to increase ventilation and reverse the wet litter condition. Unfortunately, litter conditions tell you nothing about how well you are ventilating today; litter conditions indicate only how well you ventilated up until today. It is better to maintain house humidity at a level that prevents wet litter than to try to dry it out.

Intestinal Health

Sometimes overlooked, **good gut health helps keep litter dry**. Any challenge to the gut, regardless of the source, can cause subclinical or even clinical enteritis. Enteritis often causes diarrhea, resulting in increased nutrient and moisture excretion into the litter (Bilgili et

al., 2010). Be aware of potential gut challenges, such as

- mycotoxins, which can disrupt gut microflora, and
- too much salt in the feed, which may greatly increase water intake and excretion rates. Make sure feed bins do not contain old, moldy feed stuck to the sides that may contaminate the feed supply. Monitor water intake daily for unexpected increases, which may signal a problem related to the diet.

Summary

Footpad dermatitis is characterized by lesions on the footpads and has important economic and welfare implications for the poultry industry. **While there are many factors that contribute to FPD, the primary factor appears to be wet litter.** Managing the house environment properly is the best way to prevent FPD. Farms that control moisture well produce the best paw quality in the field and at the processing plant. This is important to integrators from an economic standpoint, but it is perhaps even more important to growers from a welfare standpoint. Paw quality, a point of inspection during animal welfare audits, indicates how well a grower has cared for the birds and maintained conditions within the house.

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