Feeding Broiler Litter to Beef Cows

D. G. Pugh, *DVM, MS, Diplomate ACT & ACVN*
College of Veterinary Medicine
Auburn University, Alabama

Broiler litter has been successfully utilized in the rations of cattle for various production types. Litter averages 50% total digestible nutrients (TDN), which is comparable to good quality hay (Table 1). The crude protein content usually averages 24% to 31%, with much of this nitrogen in the form of non protein nitrogen (NPN). Therefore the protein in broiler litter is utilized most efficiently when fed to animals with a functional rumen. Broiler litter that is fed should have a crude protein content of > 18%, with < 25% of protein in a bound form; an ash content of < 28%; of uniform color and odor; and free of nails, wire, and other metallic particles. Litter not meeting these specifications should not be fed. Broiler litter is very abrasive and corrosive and may accelerate wear and reduce the working life of feed handling equipment more quickly than other commonly used feed stuffs. Moist litter does not flow through auger systems well, while litter <12% moisture is dusty and less palatable to cattle.

Table 1. A Comparison of the Nutrient Content of Broiler Litter and Other Commonly Used Feed Stuffs.

	TDN	CP	CF	Ca	P
Broiler Litter (Dry Matter)	50	24.9	23.6	2.4	1.8
Coastal Bermuda Hay	53.9	9.9	32.5	0.34	0.16
Alfalfa Hay	53.8	17.0	30.6	1.41	0.24

In order to prevent Vitamin A deficiency, Vitamin A should be added to litter-containing rations (1500 IU/lb of feed). Alternatively, cows should be fed good quality hay or allowed to graze pasture to increase β carotene intake. Ionophores can be added to rations containing broiler litter (150 mg/day for calves < 700 lbs. b.w. and 200 mg/day for calves > 700 lbs. b.w.) in order to maximize efficiency and decrease the incidence of bloat, as litter by itself has minimal effective fiber. Most of the bedding materials used in broiler houses may be high in crude fiber but are relatively short in length, and are deficient in effective fiber. The addition of long stem hay to litter containing rations may also help reduce bloat and improve rumen health.

The combination of litter to grains or by-product feeds (eg., ground corn, hominy, whole cottonseed, etc.) will improve palatability and provide a carbohydrate source for the assimilation of protein from the NPN by rumen microbes. If grains are added they should be ground or cracked to help minimize feed "sorting". Broiler litter has been used to successfully replace soybean meal in cattle rations during the finishing phase. Steers weighing 600 - 700 lbs have been effectively fed up to 30% of their ration as broiler litter, and stocker cattle can be expected to gain an average of 2 lbs/day on litter-corn rations. The addition of broiler litter to rations has been shown to reduce the finishing cost up to 23% over more traditional feedstuffs in some feeding systems. Although regulation may vary state to state, it is recommended that the feeding of broiler litter be discontinued at least 15 days prior to slaughter in order to minimize the potential for antibiotic residues.

Infectious Diseases

Deep stacking is a practical method for processing litter in order to destroy pathogenic bacteria and decrease the incidence of infectious disease, without destroying the nutritional quality of the feed. Litter which contains less than 25% moisture should be stacked to a height of 12 feet and covered with 6 mil polyethylene to limit oxygen exposure for 20 days feeding. The temperature generated by deep stacking (approximately 130°F) will kill pathogenic bacteria directly, and will aid in the formation of ammonia from urea and uric acid which will further destroy pathogens. Deep-stacked litter containing more than 25% moisture or freely exposed to oxygen will have excessive heat buildup, resulting in reduced quality of the litter as a feedstuff. Broiler litter

The North American Veterinary Conference Proceedings, Volume 10, 1996 Orlando, Florida

averages 19-20% moisture when it is harvested. If litter over-heats during deep-stacking, the amount of bound nitrogen increases with concurrent decreased digestibility. Nitrogen digestibility and palatability can be increased by 20% for beef steers by covering deep stacked litter with plastic in order to limit heat production.

Other methods of controlling pathogens include lowering pH (eg. ensiling, spraying with acetic acid, etc.) or by pelleting. Broiler litter is very basic with a pH of 7.5 or greater, therefore litter should have a moisture content of approximately 40% if it is to be ensiled. The heat generated by the pelleting process will destroy pathogenic bacteria. Although infectious diseases have been reported in cattle fed improperly handled litter, in a survey performed by Auburn workers, only a few of the surveyed veterinarians (9.5%) who treated cattle fed broiler litter saw an association with salmonella, while 19% believed they saw enterotoxemia associated with feeding in cattle fed broiler litter. In the same survey, 66% of the veterinarians whose clients fed broiler litter had it deep stacked, 33% ensiled the litter, and the remaining veterinarians were unaware of any precautions being taken by producers in their practice.

Metal Toxicoses

Arsenic, copper, iron, manganese, and zinc may approach concentrations which are toxic to cattle. Copper toxicosis can occur in cattle when litter with 300-400 ppm copper is fed for extended periods; most commonly in *Bos indicus* or *Bos indicus* crossbred cattle and usually in cattle under 2 years of age. Copper concentration from surveyed samples of litter averaged 473 ppm (range 25-1,003 ppm). This high level may be reduced as the poultry industry alters the copper content of broiler rations. Adult cattle may be fed litter with a copper concentration of 600 ppm or less if the feeding period does not exceed 120 days. Younger growing cattle may be fed a 50-50 mixture of grain and litter for up to 180d without copper toxicosis in most instances. If the litter is diluted or mixed with other feedstuffs, the feeding period may be extended. Where possible, both the copper and molybdenum concentration should be determined on litter. If the ratio of the concentration of copper to molybdenum in the diet remains between 5:1 and 8:1, the incidence of copper toxicosis can be reduced. Arsenic toxicosis, although rare, has also been reported in cattle consuming broiler litter.

Hypocalcemia

Surveyed Alabama veterinarians who treated cattle fed broiler litter responded that the most common problem associated with the feeding of litter was hypocalcemia in postpartum brood cows. Calcium and phosphorus intake should be restricted during the late gestation in order to help prevent hypocalcemia. Broiler litter averages 2.3% calcium (range 0.81-6.13), 1.6% phosphorus (range 0.56-3.92) with an ash content of 24.7% (range 9-54%). Pregnant cows fed this concentration of calcium and phosphorus during the prepartum period may be predisposed to the development of hypocalcemia. Hypocalcemia observed in beef cows fed broiler litter usually occurs 1 to 4 weeks postpartum.

To help minimize cases of hypocalcemia, it has been recommended that a feed be offered which is slightly acidic or has a cation-anion ratio of -15 meq/100 gm. A slightly acidic diet has been hypothesized to produce a metabolic acidosis, which results in an increased activity of parathyroid hormone. A subsequent increased absorption and resorption of calcium will then occur. An alkalotic diet, which may be produced by feeding excessive cations may have the reverse effect. Using the formula of [(Na+K)-CL/100gm] of dry matter broiler litter containing feeds have been shown to be slightly alkalotic (N+28Meq/100gm). The cation to anion imbalance could contribute to the incidence of hypocalcemia in the beef cow. Auburn workers demonstrated significantly depressed serum calcium concentration in cows at parturition which were fed broiler litter *ad lib*, as compared to normal serum calcium concentrates in those fed a more traditional forage based diet.

The author recommends that broiler litter not be fed 3 to 4 weeks prior to parturition. The removal of broiler litter from the diet of the prepartum cow would, in most instances, lower both calcium and phosphorus intake. The reduction of calcium and phosphorus concentrations in prepartum diets of cattle is currently used to help control milk fever. Lactating cows should be fed litter only if it meets recommended guidelines and is mixed with other feeds. If signs of hypocalcemia occur, the cow may be successfully treated with calcium solutions IV, SQ, and/or P.O. Unfortunately a few affected cows appear clinically unresponsive to calcium preparations and regardless of therapy, are lost.

Miscellaneous

Impaction of the gastrointestinal tract has been reported when animals are fed broiler litter that has unusually large quantities of dirt. Impactions may be prevented if litter used for feed is analyzed, and not fed when the ash content is greater than 28%. An ash content of ≥28% is usually associated with excess dirt contamination due to poor harvesting methods.

Botulism has been suggested as a cause of death in some cattle fed untreated broiler litter. This can be prevented if cattle are fed litter which has been prop-

erly handled (e.g. deep stacked) and the litter is free of dead or decaying birds. Although the potential for pesticide residues, nitrate toxicity, or mycotoxicosis exist, they have yet to be reported in broiler litter fed cattle. Most broiler litter is too alkaline for mold growth, thus minimizing the production of mycotoxicosis.

Summary

Broiler litter can be used as a feedstuff for beef cattle if it is managed and fed with the potential problems in mind. All litter should be handled in order to minimize and prevent contamination of pathogenic bacteria and special attention should be given to the concentrations of copper and other heavy metals. Broiler litter should be limited or diluted by mixing with other feed stuffs in prepartum brood cows in order to control the incidence of milk fever.

There have been Israeli reports of hyperestrogenism in heifers (eg. non pregnancy associated udder growth lactation) fed 'chicken manure'. The incidence appeared to occur in <10% of the heifers (aged 6 to 15 months) fed > 12 lbs of 'chicken manure silage' daily. Upon analysis, this quantity of silage contained >1 mg estrogen daily (eg premature development, udder lactation). There appears to be no observed long-term effects on fertility.