Mid-Atlantic Regional Agronomist Quarterly Newsletter

September 2013

Dr. Richard W. Taylor, Editor
rtaylor@udel.edu
University of Delaware

Supporting Agronomists:
Dr. Wade Thomason, Va Tech
Dr. Bob Kratochvil, University of Maryland
Dr. Greg Roth, Penn State
Dr. Peter Thomison, Ohio State University
Dr. Chris Teutsch, Va Tech

To subscribe or unsubscribe, please send your request to the editor at rtaylor@udel.edu Comments, suggestions, and articles will be much appreciated and should be submitted at your earliest convenience or at least two weeks before the following dates: February 28, May 30, August 30, and November 30. The editor would like to acknowledge the kindness of Mr. Todd White who has granted us permission to use his scenic photographs seen on the front cover page. Please go to www.scenicbuckscounty.com to view more photographs.

Contributors for This Issue

Dr. Carissa Wickens, UD

Ms. Jessie Weir, UD

Dr. Hong Li, UD

Dr. Robert Dyer, UD

Dr. Richard Taylor, UD

Dr. Chris Teutsch, Va Tech

Table of Contents

Issue 8; Number 3

What's that Smell in the Barn? A Guide to Reducing Ammonia in Horse Barns

Ms. Jessie Weir, M.S.
Graduate Student
Department of Animal and Food Sciences
University of Delaware
Email: jmweir@udel.edu

Dr. Carissa Wickens
Assistant Professor and Equine Extension Specialist
Department of Animal and Food Sciences
University of Delaware
Email: cwickens@udel.edu

and

Dr. Hong Li
Assistant Professor, Department of Animal and Food Sciences
University of Delaware
Email: hli@udel.edu

Introduction

Manure is defined as the combination of feces and urine (EPA, 2003). An average 500 kg horse produces about 14 kg of feces and 8 kg of urine daily (Lawrence et al, 2003). The nutrients in manure are generated primarily from the nutrients in the diet because animals are not 100% efficient at digesting and extracting nutrients from the feeds they consume. Thus, undigested nutrients pass through the digestive system and are excreted in the feces. Dietary intake of nitrogen (i.e. nitrogen from protein and amino acids) is positively correlated with the excretion of nitrogen (N) in manure (Lawrence et al., 2003).

Ammonia (NH_3) is a colorless gas with a strong, odorous smell, produced as a by-product of the microbial decomposition of the organic nitrogen compounds in manure. It comes from urea, a nitrogen containing molecule, which is present in urine and feces. Horses excrete urea in urine to eliminate excess nitrogen, and while urea is odorless and nontoxic, it is rapidly converted to NH_3 by a naturally occurring enzyme, urease. NH_3 is extremely irritating to the mucous membranes that line the mouth, eyes and respiratory tract. Breathing in NH_3 could cause chronic and acute respiratory disease which is one of the leading causes of wastage in horses used in high performance athletic endeavors and commonly recognized in pleasure horses as well. In humans, exposure to high NH_3 causes narrowing of the throat and bronchi, fluid in the lungs, eye irritation, nausea, vomiting and dizziness.

Investigating the Effects of Bedding Type

At the University of Delaware, researchers are measuring ground floor NH_3 concentrations in horse stalls as affected by type of housing and bedding material used. In a preliminary study, four horses were housed in two different barns (an old style and a new style type horse barn; Figure 1) on shavings or straw for three days. The old style barn is constructed of concrete floors, smaller, more closed in stalls with wood walls, and with little engineering to allow for adequate ventilation (e.g. low ceiling and small windows). The new style barn has higher ceilings with a ridge vent on the roof and side vents to increase ventilation, rubber mats as the flooring in stalls, and more open stalls constructed of metal panels with mesh design. The concentration of NH_3 was measured in each stall over three different spots every twelve hours.

When housed on shavings, the concentrations were found to be lower on average than when horses were housed on straw. When horses were kept on straw, the NH_3 concentrations measured near urine spots in the stall exceeded 800 ppm. In contrast, the NH_3 concentration on shavings was found to be less than 500 ppm. While the exact levels of NH_3 that are detrimental to horses are unknown, for humans, the U.S. Occupational Safety and Health Administration (OHSA) has set a 15-minute exposure limit for gaseous NH_3 levels of only 35 ppm (ATSDR, 2004). The data from this preliminary study demonstrates that both horses and their owners could be exposed to very high and unhealthy levels of NH_3 in barns. Thus far, levels of NH_3 on the floor of stalls bedded with straw and shavings appear to be similar across the two barn types. Additional studies are needed to better understand how barn design and ventilation systems affect NH_3 concentrations in horse facilities.

Figure 1. Images of an old style barn versus a new style barn. On the left is an example of an old style barn while on the right is an example of a new style barn, both located at the University of Delaware.

Stall Amendments

Horse owners potentially have a multitude of options to help reduce the concentration of NH_3 in the barn. One common misconception is that ground limestone (calcium carbonate) will aid in reducing the amount of gaseous NH_3. Ground limestone has a high pH (alkaline, 9.4) which creates favorable conditions for the bacteria and enzymes that contribute to NH_3 formation and volatilization, resulting in elevated NH_3 production (Shah, 2006). In place of applying lime in

stalls, horse owners could use an acidifier amendment (pH less than 7) or an absorber. In poultry houses, acidifiers reduce NH_3 and improve in-house air quality. They lessen NH_3 levels by reducing microbial activities and converting NH_3 to non-volatile ammonium (NH_4). In the latter form, the nitrogen from ammonia (NH_3) does not become volatile, thus minimizing horse and human exposure.

Naturally occurring materials like zeolite (a natural clay mineral) and peat tend to adsorb NH_3 by binding or trapping the NH_3. Zeolite is also advantageous because it is non-toxic, non-caustic, and moisture-absorbing. Microbial treatments contain microbes that break down NH_3-forming molecules in urine and feces. Instead of just trapping the NH_3 (like zeolite), the microbes actually decrease the amount of NH_3 that can be formed by limiting the action of NH_3 producing microbes present in fecal material and the environment. These products are also natural, safe, and non-caustic.

Additional Strategies for Reducing NH_3

While NH_3 cannot be eliminated from horse farms, certain management practices can be implemented to help reduce both horse and human exposure to NH_3. Removing visible urine and wet bedding is the first and most basic step to reducing NH_3 levels in stalls. Make stall cleaning a daily or twice-daily practice. Another way is to optimize the amount of protein that is being fed. Many horse owners tend to over-feed protein and this excess protein is excreted in the urine and contributes to the production of NH_3 in the stalls. Lastly, horse owners can eliminate urine escape routes. Stall mat seams and gaps create the perfect place for urine to collect/hide. Wood, dirt and clay flooring can become saturated with urine. Use of seamless or locking stall mats can minimize this problem. Straw may be the preferred bedding material for some equine facilities, for example, straw bedding is recommended in foaling stalls to reduce the risk of the foal breathing in or ingesting shavings. Stalls bedded with straw may need to be cleaned more frequently, and application of a stall amendment may help to further reduce NH_3.

References

Toxic FAQ Sheet for NH3. 2004. Agency for Toxic Substances and Disease Registry (ATSDR). September. www.atsdr.cdc.gov/tfacts126.pdf

Shah, S., Westerman, P., and Parsons, J. 2006. Poultry Litter Amendments. North Carolina Cooperative Extension Service. https://www.bae.ncsu.edu/programs/extension/publicat/wqwm/poultry/factsheet_agw-657long.pdf

EPA. 2003. National Pollutant Discharge Elimination System Permit Regulation and Effluent Limitation Guidelines and Standards for Concentrated Animal Feeding Operations (CAFOs); Final Rule. Federal Register, Wednesday, February 12, 2003. United States Environmental Protection Agency. http://www.epa.gov/npdes/regulations/cafo_fedrgstr.pdf; Accessed February 13, 2006

Lawrence, L., J.R. Bicudo, and E. Wheeler. 2003b. Horse manure characteristics literature and data base review. In: 9th International Symposium on Animal, Agricultural and Food Processing Wastes, Raleigh, NC.

Further Reading

The Horse. Ammonia and Respiratory Health Fact Sheet. Available at http://www.thehorse.com/free-reports/30023/NH3-and-respiratory-health

Energy Intake, Adiposity (Body Condition) and Average Daily Gains: Metabolic/Nutrient Interactions with Reproductive Function Driving Onset of Precocious Puberty in Heifers

Dr. Robert M. Dyer, VMD, PhD
Associate Professor Animal and Food Science
University of Delaware
Email: rdyer@udel.edu

Introduction

Age at the onset of puberty is highly related to prepubertal energy intake and average daily gains. Indeed, nutrient restriction during the often forgotten or neglected post natal period, stall growth, delays onset of reproductive maturity, and the onset of cyclicity and fertility in heifers. Important work over the past 4-5 years has begun to delineate pathways whereby centers sensing nutrient and metabolic status interact with higher centers in the brain orchestrating follicle growth, maturation and ovulation in the gonads (Amstalden et al., 2011).

Work across a variety of animal species strongly indicates these higher centers of neurologic and endocrine function in the brain are anatomically integrated and impacted by nutrient status very early in the neonatal and prepubertal adolescent periods of growth. As a result, the onset of puberty in heifers is quite sensitive to nutrient and metabolic input very early in life. The nutrient effect can augment the onset of puberty before 300 days in heifers undergoing high rates of average daily gain (ADG) or delay the onset of puberty past 300 days in heifers experiencing lower ADG. Importantly, the data shows heifers can consume sufficient energy to drive different rates of gains in body weight but only those achieving *high rates* of ADG achieve precocious puberty. Growth *per se* is not the issue. Thus, nutrient levels high enough to sustain high rates of growth during the 3-7 months of prepubertal development is a key factor (Gasser et al., 2006a, 2006b, 2006c, 2006d).

Production Implications of Precocious Puberty

The onset of reproductive maturity results from the integrated activities of the endocrine and nervous systems in heifers (Amstalden et al., 2011). Precocious puberty can be best defined as the onset of cyclicity with waves of follicle growth and maturation that generate ovulatory follicles prior to or by 150-180 days (5-6 months) of age. Onset of precocious puberty ensures

heifers achieve sexual maturity and puberty at 40-45% (500-530 lb. body weight) and are inseminated at 60-65% mature body weight (BW) at 10-11 months of age. These targets enable heifers to progress through at least 3 estrous cycles prior to insemination to avoid insemination on the first estrus of puberty. **This practice increases conception rates at the time of insemination by as much as 20% over conception rates on the first estrus of puberty.**

With a gestation length of 280 days (9-9.1 months) these goals allow replacement heifers to calve by an average age of 24 months at 85-90% of adult body weight. Entry into first lactation at 24 months also maximizes lifetime productivity and increases returns on the $1,500 investment for each replacement heifer. Total investment in replacement heifers can be substantial in larger herds where annual culling rates (and therefore replacement animal requirements) average 30-35% of the adult herd population. Moreover, a 24 month goal for first calving reduces the number of animals that must be retained in the replacement heifer population when age at first calving becomes greater than 26 months of age.

What landmarks or objectives should producers expect to achieve that ensure early onset of puberty, conception at 14-15 months and entry into the lactating herd at 24 months of age? Assuming mature BW is 1,250-1,300 lb., Holstein heifers need to achieve puberty at 40-45% (500-530 lb.) of mature BW, conceive at 60-65% mature BW (750-780 lb.) and then calve at 85-90% mature BW (Figure 1). Reaching these goals requires ADG between 1.60-1.90 lb./day. To ensure first parturition occurs at 24 months of age, heifers also need to enter precocious puberty between 8-10 months of age, and then conceive at 14-15 months of age. Figure 1 clearly shows heifers with low ADG will never achieve any of these milestones.

Ideally heifer weight gains, body condition score and height need to be carefully monitored to meet growth and age milestones in the prepubertal and post pubertal period of replacement development. Heifers growing too fast leave replacement pools early but may experience reduced first lactation milk yields (Sejrsen and Purup. 1997). Data is conflicting on whether these diminished milk yields in rapidly grown animals carry over into 2nd and later lactations. Ideally, rates of growth should be monitored to ensure replacements heifers calve at 1,250-1,300 lb. by 1st lactation.

Discussions about high prepubertal ADG, BW and BCS always raise concerns about effects on mammary gland development because gland development during the prepubertal and peripubertal periods does impact milk yields. Normally, gland growth is proportional to gains in BW during the 1-2 month neonatal period and involves growth of ducts and supporting tissues. After 2 months, mammary growth surpasses gains in BW and involves ducts and fat tissues. Duct growth is critical for development of secretory tissue later during gestation. The onset of puberty (whether precocious (8-10 months or normal (11-12 months) normally slows mammary development. Although high rates of ADG enable earlier onset of puberty, a body of conflicting work (Daniels et al., 2009, Meyer et al., 2006, Davis-Rinker et al., 2006) exists about the effects of high ADG on mammary development in heifers. Some reports indicate planes of nutrition associated with growth rates of 1.5 lb-1.6 lb./day may damage mammary gland growth and development, others show no effect of 2.0 lb./day gain on glandular development while still other reports of ADG as high as 2.3 lb./day hinder growth of mammary tissues.

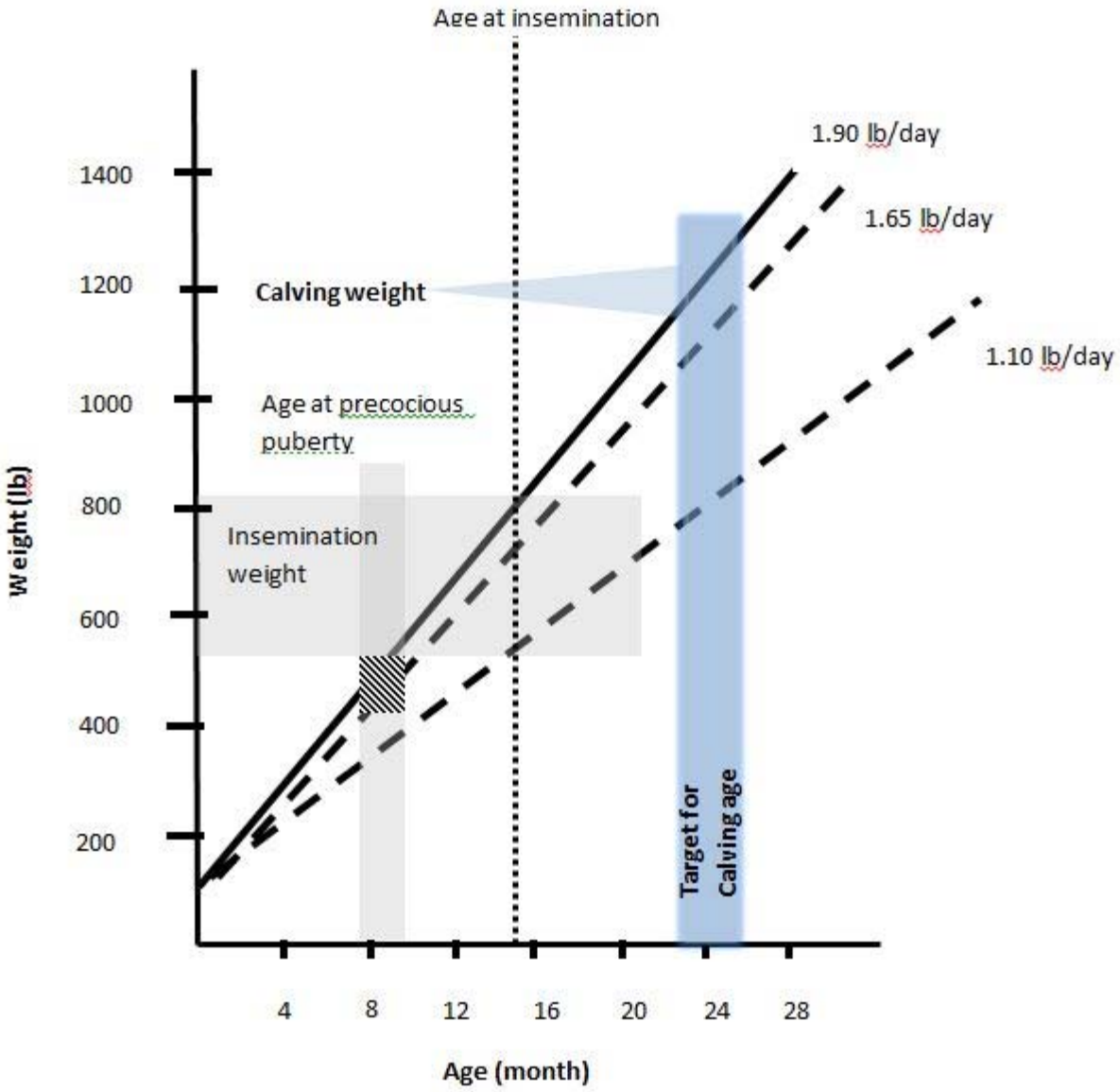

Figure 1. Higher rates of average daily gain (ADG) in heifers during the prepubertal period (1.61-1.90 lb.) produce heifers that enter into puberty at a desirable age of 8-10 months (precocious puberty). Lower rates of ADG (1.10 lb.) do not promote adequate gains in body weight that support the onset of precocious puberty by the 8-10 month window. Note the cross hatched area (▨) marks the ideal weight and age for onset of precocious puberty.

Most work indicates when development is diminished the effect is limited to the prepubertal period of mammary development (2-8 months). Higher rates of ADG consistently increase fat deposits in the mammary tissue. However, rations with corn silage as the main component tend to favor excess fat deposition in association with higher rates of ADG. In these instances, excess fat deposition can diminish mammary development (Capuco et al., 1995, Silva et al., 2000). Interestingly, high rates of ADG attributable to non-adipose tissue deposition do not appear to impair mammary development (Siva et al., 2002). Altogether, data on higher planes of nutrition that support greater prepubertal ADG indicate there are great advantages stemming from enhance

reproductive development but potential disadvantages due to diminished mammary development. The association of excess intramammary adipose tissue deposition on mammary development warrants producers to pay particular attention to growth rates in conjunction with body condition scores in heifers. Since BCS is a reasonable estimate of adiposity, prepubertal heifers with BCS greater 2.5 may be at risk for under development of the mammary gland. Post pubertal rates of growth do not seriously impair mammary development.

Effect of Nutrition and ADG in the Pre- and Post-puberty Periods on the Onset of Puberty

Many studies have clearly established prepubertal and post pubertal energy intake and ADG impact the onset of precocious puberty (puberty at less than 300 days of age) (Radcliff et al., 1997, Schillo et al., 1992, Gasser et al. 2006a,b,c,d). Gasser (2006a,b,c,d) showed the effect of energy intake and ADG on onset of puberty was most pronounced in the early post-natal period (3-6 months of age) and had considerably less effective during the adolescent period immediately before the onset of puberty (6.5-13 months of age). Precocious puberty occurred on average at 9 months of age when heifers were fed high energy diets and showed higher ADG at 4-6 months of age. Heifers fed low energy diets and therefore achieving lower ADG during 4-6 months of age did not achieve puberty until 11 months of age. Delays in the onset of puberty in heifers on low energy diets during the 4-6 month prepubertal period were not corrected when these heifers were switched to higher energy diets 6.5-13 months immediately before the onset of puberty.

The take home message is that the onset of precocious puberty is driven by high energy intake and higher ADG in the 4-6 month post weaning period. Compensatory gains later in adolescent life cannot completely reverse the delay in onset of puberty associated with lower energy diets and poorer ADG at 4-6 months of age. The rate of growth after 5-6 months of age can be increased in poor gaining heifers at 3-6 months without much effect on the onset of puberty. Note, ADG was not the issue because all heifers gained weight and grew. The important concept is that only those energy levels great enough to support higher rates of ADG support earlier onset of puberty.

Neuroendocrine Factors Supporting Reproductive Development and the Onset of Puberty

Onset of puberty in heifers is initiated in higher centers in the brain that control release of gonadotropin releasing hormone (GnRH). Producers are very familiar with this hormone through its use in Ov Sync and, Pre Sync programs and treatment of cystic follicular degeneration in adult cows. Prepubertal increases in amplitude and frequency of pulsatile GnRH release from reproductive centers in the brain mark the onset of precocious puberty (Figure 2) at 8-10 months of age.

Recently, a number of studies have begun to untangle the complex interactions between fat stores, metabolic/nutrient sensing systems and the reproductive centers in cattle (Gasser et al., 2006a, 2006b, 2006c, 2006d, Allen et al., 2011, Armstalden et al., 2011, Redmond et al., 2011). These interactions integrate nutritional/metabolic status with the state of fertility (see Figure 3).

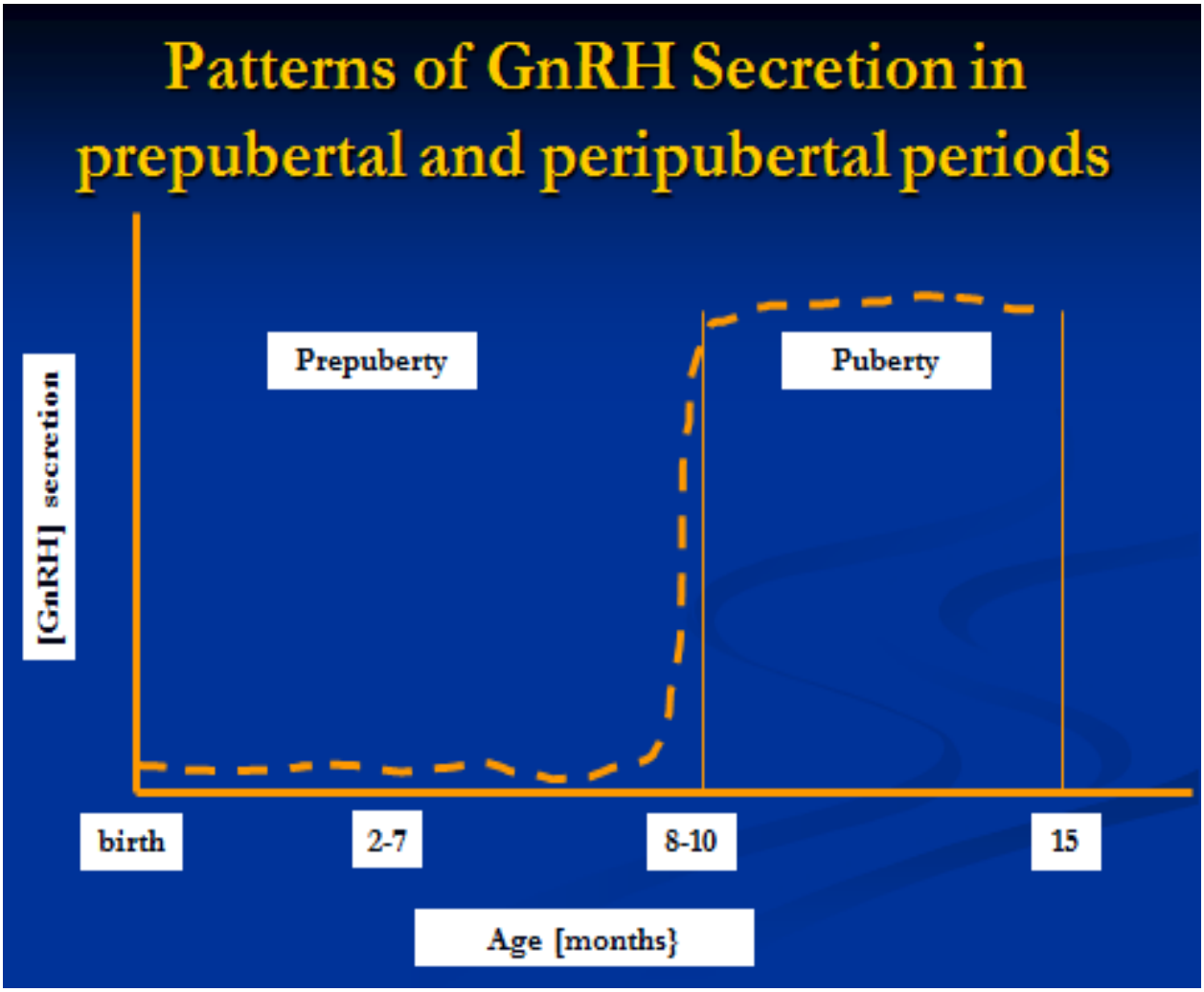

Figure 2. Low amounts of GnRH during the prepuberty period change to high amounts of hormone release at the onset of precocious puberty and cycling in heifers. Changes in GnRH are regulated by signals that integrate metabolic/nutrient sensing centers with reproductive centers in the brain.

An important issue is recognition that fat synthesizes and secretes a hormone called leptin that signals the size of fat stores (therefore BCS) to nutrient/metabolic sensors in the brain. These nutrient/metabolic sensors regulate dry matter (appetite) and energy intake. In addition, the metabolic/nutrient sensing centers are anatomically "hard wired" by nerves to neighboring centers in the brain that control reproductive development, cyclicity, follicle growth, follicle development and ovulation (Figure 3). Higher energy intake increases fat stores (higher BCS) and therefore leptin signals to the metabolic/nutrient sensing centers.

In the context of higher energy intake and therefore BCS (2.25-2.5), the metabolic/nutrient sensing centers increase positive signals (POMC) while decreasing braking signals (NPY) to reproductive centers. The net effect is to increase reproductive center output in the form of increased GnRH secretion that eventually drives ovarian functions such as folliculogenisis, ovulation, steroidogenisis, ovulation and the onset of puberty. Indeed, one endocrine manifestation of the onset of puberty is circulating levels of progesterone greater than 1 ng/ml serum in heifers. Thus, growth rates, the size of adipose depots and BCS are closely related to

the onset of puberty in heifers. The hard wiring between higher centers in the brain partially explains why growth restriction and lower ADG in prepuberty heifers delays the onset of puberty.

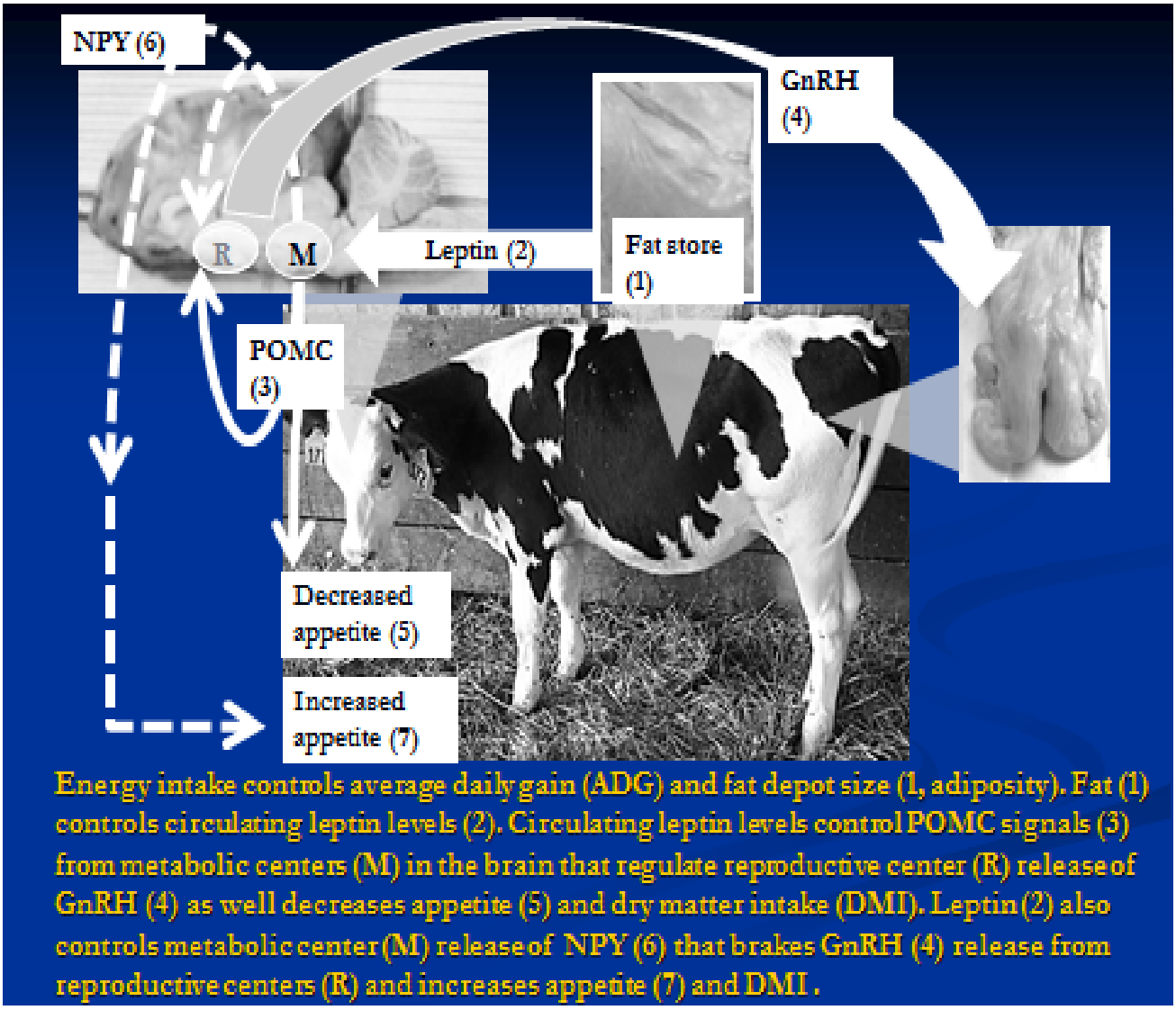

Figure 3. Onset of puberty is controlled by communication between fat stores, higher centers in the brain that consist of nutritient/metabolism sensing elements (M) hard wired to reproductive (R) centers in the brain. The reproductive centers communicate with the reproductive tract by producing GnRH. Signals from nutrient/matabolic centers can increase or decrease GnRH release and therefore the onset of puberty by reproductive centers in the brain.

Conclusion

Young stock can be nutritionally pushed into precocious puberty by feeding diets designed to achieve higher ADG and BCS. ADG and BCS however, need be monitored closely to ensure age-dependent changes in ADG and BCS are neither too little nor too big. Combined use of targets for whither height (Figure 4) and body weight (Figure 1) within each breed is an excellent method to guide pre- and post-puberty growth and development.

Excessive ADG and BCS can lead to underdevelopment of mammary glands and obesity at 24 months and first calving. ADG and BCS that are too low lead to delayed puberty, delayed conception and first calving past 24 months of age. In Holsteins, pre-pubertal ADG between 1.6-1.9 lb. /day and BCS 2.5-3.0 usher in precocious puberty. The reproductive goals are to achieve conception at 14-15 months of age in heifers at 60% of mature body weight and BCS of 3.0 (Heinrichs and G.L.Hoffman, 1987, Hoffman. 1997). Heifers should achieve precocious puberty at less than 300 days of age and 40-4% of body weight. Onset of puberty at this age enables breeding 3 or more estrous cycles after the first estrus of puberty. Higher growth rates after 6-6.5 months of age may not completely restore reproductive advantages to levels garnered by heifers with higher growth rates prior to 6-6.5 months of age. Calves experiencing the entire spectrum of neonatal and pre-pubertal disease problems show delayed gains and greater age at first calving. Poorer nutrition, disease problems and environmental factors that diminish ADG for longer periods of time in the prepuberty period can be expected to delay the onset of puberty and extend age at first calving.

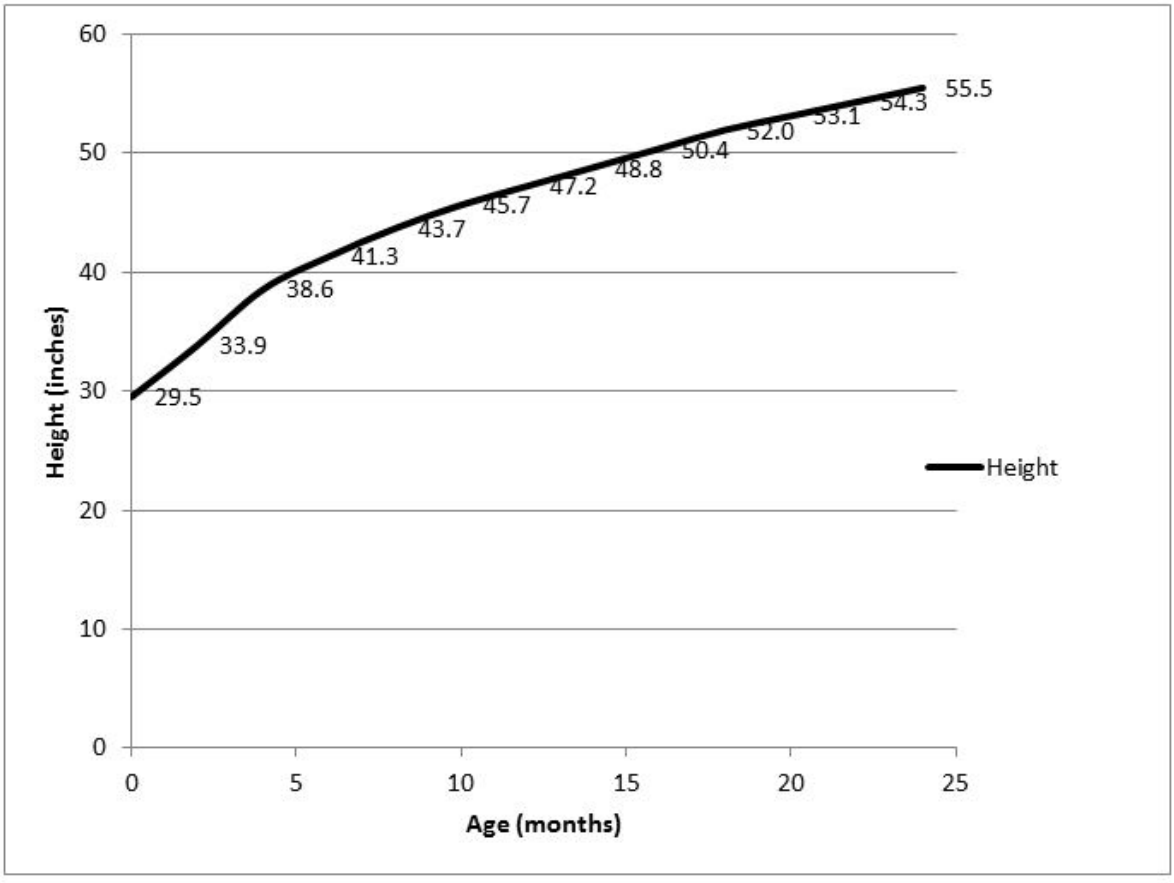

Figure 4. Replacement heifer whither height by age (after Hoffman, 1997, Heinrichs and Hargove, 1987).

References

Allen, C.C., B.R.C. Alves, X. Li., L.O. Tedeschi, H. Zhou, J.C. Paschal, P.K. Riggs, U.M. Brago-Neto, D.H. Kiesler, .L. Williams, and M. amstalden. 2012. Gene expression in the arcuate nucleus of heifers is affected by controlled intake of high and low concentrate diets. J. Animal. Sci. 90: 2222-2232.

Amstalden, M., B.R.C. Alves, S. Liu, R.C. Cardosa, and G.L Williams. 2011. Neuroendocrine pathways mediating nutritional acceleration of puberty: insights from ruminant models Front. Endocrin. 2: 1-7.

Capuco, A.V., J.J. Smith, D.R. Waldo, and C.E. Rexrod. 1995. Influence of Prepubertal dietary regimen on mammary growth of Holstein heifers. J. Dairy Sci. 78: 2709-2716.

Daniels, K.M., M.L. McGilliard, M. Meyer, M.E. Van Amburgh, A.V. Capuco and R.M. Akers. 2009. Effects of bodyweight abd nutrition in histological mammary development in Holstein Heifers. J. Dairy Sci. 92:499-505.

Davis Rincker, L.E., M.S. Weber Nielsen, L.T. Chapin, J.S. Liesman, K.M. Daniels, R.M. Akers, and M.E. Van Amburgh. 2008. Effects of feeding prepubertal heifers a high energy diet for three, six and twelve weeks on mammary growth and development. J. Dairy Sci. 91: 1926-195.

Davis Rincker, L.E., M.S. Weber Nielsen, L.T. Chapin, J.S. Liesman, K.M. Daniels, R.M. Akers, and M.J. Vandel-Haar. 2006. Effecs of feeding Prepubertal heifers a high energy diet for three, six and twelve weeks on mammary growth and development. J. Dairy Sci. 91: 1926-1935.

Gasser, C.L., M.L. Mussard, J. E. Kinder, and M.L. Day, and M.L. Day. 2006. Effect of time of feeding and high concentrate diet on growth and attainment of puberty in early-weaned heifers. J. Animal Sci. 84: 3118-3122.

Gasser, C.L., G.A. Bridges, M.L. Mussard, J. E. Kinder, and M.L. Day. 2006b. Induction of precocious puberty in heifers. III. Hastened reduction of estradiol negative feedback on secretion of luteinizing hormone. J. Animal. Sci. 84: 2050-2056.

Gasser, C.L., C.R. Burke, M.L. Mussard, E.J. Belke, D.E. Grum, J. E. Kinder, and M.L. Day. 2006c. Induction of precocious puberty in heifers. II. Advanced follicular ovarian development. J. Animal Sci. 84: 2042-2049.

Gasser, C.L., D.E. Grum, M.L. Mussard, F.L. Fluharty, J. E. Kinder, and M.L. Day. 2006d. Induction of precocious puberty in heifers. I. enhanced secretion of luteinizing hormone. J. Animal Sci. 84: 2035-2041.

Heinrichs, A.J, and G.L. Hargrove. 1987. Standards of weight and height for Holstein Heifers. J. Dairy Sci. 70: 653-660.

Heinrichs, A.J. and B.S. Heinrichs. 2011. A prospective study of calf factors affecting first lactation and lifetime production and age of cows when removed from herds. J. Dairy Sci. 96: 336-341.

Hoffman, P.C. 1997. Optimal body size of Holstein heifers. J. Animal Sci. 75: 836-845.
Meyer, M.J., A.V. Capuco, D.A. Ross, L.M. Lintault, and M.E. Van Amburgh. 2006. Developmental and Nutritional regulation of prepubertal bovine mammary gland development: II. Epithelial cell proliferation, parenchymal accretion rate and allometric growth. J. Dairy Sci. 89: 4298-4304.

Radcliff, R.P., M.J. VandeHaar, L.T. Chapin, T.E. Pilbeam, D.K. Beede, E.P. Stanisiewski, and H.A. Tucker. 2000. Effects of diet and bovine somatotropin on heifer growth and mammary development. J. Dairy Sci. 80:1996-2003.

Redmond, J.S., G.G. Macedo, I.C. Velez, A. Caraty, G.L. Williams, and M. Amstalden. 2011. Kisspectin activates the hypothalamic-hypophyseal-gonadal axis in prepubertal ewes. 141: 541-548.

Schillo, K.K., J.B. Hall, and S.M. Hileman. 1992. Effects of nutrition and season on the onset of puberty in beef heifers. J. Animal Sci. 70:3994-4005.

Silva, L.F., M.J. VandeHaar, B.K. Whitlock, R.P. Radcliff, and H.A. Tucker. 2000. Short communication: relationship between body growth and mammary development in dairy heifers. J. Dairy Sci. 85: 2600-2602.

Worried about ODS: Scout Orchardgrass Now to Check for Orchardgrass Decline Syndrome

Dr. Richard W. Taylor
Extension Agronomist
University of Delaware
Email: rtaylor@udel.edu

Over the past few weeks, I've been called out to a couple of orchardgrass fields that are showing initial evidence of orchardgrass decline syndrome (ODS). This syndrome often results from a mix of several problems that develop on orchardgrass. ODS can be caused by one or more of the following problems: an imbalance between the rate of nitrogen (N) fertilizer and potash or potassium (K) fertilizer applied to the crop; an infestation by one or more pest species (white grubs, wireworms, billbugs, curculio, mites, thrips, aphids, and/or nematodes); mowing too close to the soil surface and leaving too little stubble for orchardgrass regrowth; and the development of a series of diseases such as anthracnose, septoria leaf spot, brown stripe, brown leaf blight, and barley yellow dwarf virus.

In the fields that I observed, the browning leaf tips and leaves (Photo 1) were an indication that the disease complex was present in the field. The real telling story however was where

woods that were on two sides of the field was blocking wind movement and resulting in higher humidity and longer periods of moisture on the leaves following dew or rain events. Near the wood line, the orchardgrass stand had been reduced by 95 to 99 percent with only a few small plants showing a few struggling small tillers.

Photo 1. Leaf symptoms on orchardgrass from a complex of diseases thought to be associated with orchardgrass decline syndrome in the Mid-Atlantic region. (Photo by R. Taylor)

Along some of the wood line, the stand loss extended only a few tens of feet into the field; but where the two sides of woods came together, the stand loss extended as much as several hundred feet into the field. This suggests that if anyone is interested in determining if they have a potential situation developing with ODS, they should evaluate the orchardgrass stand along wood lines or wherever the winds are blocked resulting in longer periods of moisture on the leaves or higher humidity conditions. The excessive rainfall that we've had this year could have resulted in a number of fields at risk for ODS.

Now is the time to evaluate orchardgrass fields to determine if it will be necessary to replant the field early this fall. The best thing to do would be to rotate to another less susceptible grass crop or to rotate completely away from grass hay if there's a market available to you for legume (such as alfalfa) hay. No matter what the decision is, you should take a soil test for the field to determine the K status. Inadequate soil K levels have been linked to the disease especially when a lot of N fertilizer is applied to boost hay yields.

Winter Grazing—How and When to Stockpile Tall Fescue

Dr. Richard W. Taylor
Extension Agronomist
University of Delaware
Email: rtaylor@udel.edu

Would you like to be able to reduce your winter hay feeding bill? If so and if you have a pasture that has a large percentage of tall fescue, why not consider stockpiling the tall fescue to winter graze. Depending on fall weather conditions, tall fescue stand density, stocking rate for grazing, and the type of grazing system employed, a grazer can get an extra 6 to 8 or possibly more weeks of grazing starting in early December.

What is involved in the process of stockpiling tall fescue? The first thing to do is to stop any grazing or hay harvesting on the selected pasture and then to apply from 50 to 70 lbs. of nitrogen (N) per acre as soon as possible but between August 15 and September 1. Grazing of the pasture should not begin again until late-November or December whenever the other pastures become depleted of feed.

The applied N fertilizer should be a quick release form such as urea or ammonium sulfate rather than a slow release form such as manure, other organic sources, or polymer coated urea. The use of a nitrification and/or urease inhibitor is useful especially with the history of heavy rainfall so far this growing season (2013). Products designed to reduce N loss from leaching and/or denitrification include nitrapyrin (N-serve®), SuperU®, agrotain®, or agrotainplus®. These products do slow the conversion of N from urea to ammonium or from ammonium to nitrate but the activity is limited to one to two weeks and do not interfere with the uptake of N by the tall fescue crop. They help prevent the environmental loss of N and therefore help increase plant uptake and promote more top growth.

A second application of 30 to 50 lbs. N/acre is suggested from early or mid-October to early November to help increase the protein content of the stockpiled tall fescue, possibly increase the total yield produced, and to encourage more and deeper rooting of the tall fescue for next year's production. It is thought that late-fall N may help tall fescue plants lay down tillers that will help thicken the fescue stand next year.

When the available forage in the remaining pastures becomes too little to support the grazing animals, the accumulated tall fescue forage can be grazed. Palatability really increases following some hard frosts or freezes so we generally recommend that grazing not begin until December. The freezing process is thought to release or convert carbohydrates to simple sugars which encourages the grazing animals to select the fescue and consume it readily. If the accumulated fescue pasture can be grazed in strips to limit animal access to the forage, there will be substantially less wasted forage. The use of moveable fences (usually electric) so that just a day or a few days' supply of forage is provided each time the fence is moved really helps extend the number of grazing days you can have from the stockpiled fescue.

Like any grazing system if the weather is too wet, animals should be kept either inside or in a sacrifice holding lot and fed hay rather than allowed onto a pasture where their hoofs can cause compaction problems or tear up the forage stand.

Stockpiling tall fescue is an effective way to extend the grazing season and stretch hay supplies. The rainy and often unpredictable weather this year has made hay production very difficult and good quality hay likely will be in short supply and only found at a high cost. With the expense of a little money for N fertilizer and the time and effort of moving fences, a grazer can significantly reduce their feed cost.

Delaware Ag Week 2014—Added Attraction for Corn Growers

Dr. Richard W. Taylor
Extension Agronomist
University of Delaware
Email: rtaylor@udel.edu

On Wednesday evening from 6 to 9 pm on January 15, 2014, the agronomy planning committee has secured Mr. King Corn, himself, better known as Dr. Bob Nielsen from Purdue University to speak about corn production problems that growers often encounter. Many producers may currently follow Dr. Nielsen's 'Corny News Network (CNN) via the articles posted online at the Chat 'n Chew Café on the web at http://www.kingcorn.org.cafe. The same articles are also available by accessing the Café in a mobile Web format at http://www.kingcorn.org/cafe/mobile.html. Dr. Nielsen is also found on Twitter via @PurdueCornGuy.

Dr. Nielsen will speak first on stress effects on corn during different development stages. A brief abstract of that talk follows. "From germination to ultimate death of the plant after seed maturation, a variety of stresses can impact development of the corn plant. This session will begin as corn seed is placed in bags for delivery to the farmer and trace the effects on crop growth and development that result from a variety of crop stresses throughout the life of the crop. Learn about the impact on crop performance caused by various stresses as well as management options for minimizing the effects of those stresses." This first talk will run from 6:00 to 7:30 pm and be followed by a short break.

Dr. Nielsen has also agreed to present a second talk entitled '**Growin' Good Corn: Rocket Science or Common Sense?**' which will run from 7:45 to 9:00 pm. The following is a brief abstract that Dr. Nielsen has provided us. "World population continues to increase. Global demand for food continues to increase. Grain yields of major agronomic crops need to increase to meet this demand. Some believe that "biotech" hybrid traits have already helped us begin to "turn the corner" on increasing grain yield. Consequently, some predict the average U.S. national corn yield will be 300 bu/ac by the year 2030. Does history offer any guidance on the likelihood of achieving this? What does it require to significantly "raise the bar" for corn yields? Join us for a lively discussion."

A few of our local growers have heard Dr. Nielsen speak at our annual Mid-Atlantic Crop Management School and can certainly testify to the lively discussions that can occur with Bob in the room speaking. Please set aside this date (January 15, 2014) and time (6 to 9 pm) and join us for a great discussion of corn production in the Dover Building on the Delaware State Fairgrounds in Harrington, DE.

An added note: Dr. Nielsen will join us for the Agronomy/Soybean Day Thursday program and speak on 'Reading Corn Ears' on Thursday morning so plan to be back bright and early on January 16, 2014 for another great program.

Exciting Topics for Agronomy/Soybean Day during DE Ag Week on Jan. 16, 2014

Dr. Richard W. Taylor
Extension Agronomist
University of Delaware
Email: rtaylor@udel.edu

In this article, I would like to cover the program we've put together for field crop producers in the Mid-Atlantic region for the Agronomy/Soybean Day on Thursday, January 16, 2014 as a component of Delaware Ag Week.

The morning program will start at 9 am with Dr. Mark VanGessel discussing corn and soybean weed control options for 2014. Mark will be followed by Dr. Doug Beegle from The Pennsylvania State University who will cover the importance of sulfur, lime, and soil pH in crop production. Dr. Beegle supplied the following short abstract for what will be covered in his talk. "Supplying adequate sulfur and maintaining a proper pH are both critical to successful crop production. While these two important management considerations are really independent, there are connections between them. For example, some sulfur materials, like ammonium sulfate, are acidifying and while gypsum is a good source of sulfur and calcium it is not a liming material. The management of sulfur and soil pH and how they might be linked will be discussed."

Following Dr. Beegle, Dr. Bob Nielsen from Purdue University will speak on 'Reading Corn Ears'. Dr. Nielsen will show and discuss many of the problems we see on the ears of corn with particular emphasis on some of the problems that have been seen this year. After Dr. Nielsen, the morning program will be closed out by Dr. Nathan Kleczewski, the new Extension Plant Pathologist at University of Delaware. Dr. Kleczewski will talk about scab control in small grains and be relating the latest available information on this topic. We'll break for lunch following Dr. Kleczewski's presentation.

After lunch, we'll have the usual Delaware Soybean Board update and then the presentation of the Environmental Stewardship Awards. Following that, Ms. Joanne Whalen will give everyone an update on field crop insect management. Each season we are faced with familiar as well as new invasive insect pests that threaten field crop production on Delmarva. The presentation will

address the damage potential and management strategies for current, re-emerging and new insect pests of soybeans, field corn and small grains. Partial emphasis will be placed on identification, sampling and management of the new invasive insect pest of soybeans, the Kudzu bug.

The insect update will be followed by Dr. Jim Glancey who will discuss updating the EPA Chesapeake Bay Model to reflect modern poultry production technologies and practices. The EPA is currently estimating the impact of poultry production on water quality in the Chesapeake Bay based on research conducted in the 1980's. Evaluation of current production methods and technologies indicate the amount of nitrogen and phosphorous generated by the poultry industry within the bay watershed is significantly lower than current EPA estimates. The presentation will provide an overview of this comparison as well as a set of recommendations to the EPA for improving the bay model to better reflect current poultry production practices.

Rounding out the program, Mr. Dave Mayonado of Monsanto will talk about the interaction of dicamba resistant soybeans and herbicide resistant weeds and what this may mean for control of some of these resistant weeds.

I hope you agree that we have an exciting, quality, jam-packed program for the Agronomy/Soybean Day this coming January and will mark your calendars so you can attend. See you there!

2013 Virginia Beginning Grazing School

Dr. Chris Teutsch, Forage Research and Extension
Southern Piedmont AREC
Virginia Tech
Email: cteutsch@vt.edu

This school is a joint effort of the **Virginia Forage and Grassland Council, Virginia Cooperative Extension, and Virginia Natural Resource Conservation Service**

Who: Beginning graziers and all persons who want to learn more about the science and practice of controlled grazing

When: November 12 and 13 at starting at 8 a.m.

Where: Virginia Tech's Southern Piedmont AREC, 2375 Darvills Road, Blackstone, VA

What: Each day will be a combination of interactive classroom lectures and hands on in the field learning activities. The following topics will be covered:

Day One

- Planning and infrastructure for controlled grazing systems
- Forage plant growth and grazing management
- Grazing arithmetic and stocking rate: Getting it right
- Forage species for controlled grazing systems
- In the field: water and fencing infrastructure dos and don'ts
- Hands on forage allocation exercise
- Field trip to rotationally stocked farm
- Steak dinner with guest speaker

Day Two

- Economics of controlled grazing systems
- Soils and soil fertility for controlled grazing systems
- Understanding and managing forage quality in grazing systems
- Grazing system planning exercise at local farm
- Complete and present grazing planning exercise at station
- Evaluate pasture allocation exercise

What past participants are saying:

"The grazing school gave me an excellent basic understanding of the grazing system and the importance it plays as part of the local ecosystem."

"I really appreciate that the presenters were communicating on a level I could understand and were very willing to explain concepts. I equally enjoyed the breaks and small group field sessions to ask more specific questions with the presenters and other attendees."

"This school provided great speakers and information. This provided the best hands on field demonstration I have ever been a part of."

"Lots of information and great question/answer interaction but meeting and interacting with the presenters and participants was best. I'm so glad I attended, I joined VFGC and look forward to more meetings and training."

"I drove 5 ½ hours to attend and it was well worth it. I could not have learned this stuff any other way. It was a great value and will definitely pay off for me."

About the Instructors:

Dr. Brian Campbell, Livestock Extension Specialist, Virginia Tech's Southern Piedmont AREC. Dr. Campbell started as Virginia Tech's Southern Piedmont AREC as Ruminant Livestock Production Specialist in 2012. He is a graduate of the University of Tennessee where he studied tall fescue toxicosis. His research and educational programs focus on improving beef cattle production while controlling production costs.

Taylor Clarke, Agriculture and Natural Resource Agent, Virginia Cooperative Extension. Mr. Clarke specializes in tobacco, forages, and livestock production. He has a Master's Degree in Crop Science from Virginia and has nearly two decades of experience working in Cooperative Extension. He and his wife Jody graze 80 cow-calf pairs on 225 acres of pasture in Brunswick County, VA.

J.B. Daniel, USDA-NRCS Grassland Agronomist, Farmville, VA. Mr. Daniel has a Master's Degree in Crop Science from Virginia. He has worked in cooperative extension and is currently serving as statewide Grassland Agronomist for Virginia's Natural Resource Conservation Service. Mr. Daniel works to promote the full and productive use of grasslands throughout Virginia by working with producers and agricultural professionals to implement improved grazing management and conservation practices.

Cynthia Gregg, Agriculture and Natural Resource Agent, Virginia Cooperative Extension. Ms. Gregg specializes in forages and livestock production. She has a Master's Degree in Agriculture from Western Kentucky University and has more than 20 years of experience working in cooperative extension in Missouri, North Carolina and Virginia. Ms. Gregg has recently been elected to the position of Vice President of the National Association of County Agricultural Agents.

Dr. Gordon Groover, Extension Economist Farm Management, Virginia Tech's Department of Agricultural and Applied Economics. Dr. Groover has more than three decades of experience working in cooperative extension. His research and education programs have focused on helping producers answer the question "under what conditions is this a profitable choice?"

Dr. Chris Teutsch, Forage Extension Specialist, Virginia Tech's Southern Piedmont AREC. Dr. Teutsch conducts applied forage research focusing on Virginia's Southern Piedmont Region. The objective of both his research and extension program is to reduce the need for conserved forage (hay) by extending the grazing season.

Program Registration

REGISTRATION DEADLINE: NOVEMBER 5

Name _____ Name _____

Name _____ Name _____

Address_____
Street City State Zip

Daytime Phone_____

Email_____

Registration Fee: $75.00 per attendee for current VFGC members

$100 per attendee for non-VFGC members (includes one year VFGC membership Total Amount

Enclosed $_____ Please make check payable to "VFGC"

Mail Check AND Completed Registration Form to:

2013 Virginia Beginning Grazier School
Attention: Margaret Kenny
3599 Indian Oak Road
Crewe, VA 23930

School is limited to 30 participants!!!

More information is available at www.vaforages.org or by calling 434-292-5331.

Notices and Upcoming Events

November 12-13, 2013
2013 Virginia Beginning Grazing School, Virginia Tech's Southern Piedmont AREC, 2375 Darvills Road, Blackstone, VA. For more information, visit www.vaforages.org or call 434-292-5331.

November 19-21, 2013
Mid-Atlantic Crop Management School, Ocean City, MD. Contact Josh McGrath at 301-405-1351 or by email mcgrathj@umd.edu

January 13-17, 2014
Delaware Ag Week, Harrington, DE. For more information, contact Cory Whaley at 302-856-7303 or by email whaley@udel.edu

January 14, 2014
2014 Delmarva Hay and Pasture Conference, Harrington, DE. For more information, contact Cory Whaley at 302-856-7303 or by email whaley@udel.edu or Richard Taylor at 302-545-2395 or by email rtaylor@udel.edu

January 15, 2014
2014 Southern Maryland Hay and Pasture Conference, Waldorf, MD. For more information, contact Ben Beale at 301-475-4484 or by email bbeale@umd.edu

January 15, 2014
2014 Diagnosing Corn Problems with Dr. Bob Nielsen, Harrington, DE. For more information, contact Cory Whaley at 302-856-7303 or by email whaley@udel.edu or Richard Taylor at 302-545-2395 or by email rtaylor@udel.edu

January 16, 2014
Agronomy/Soybean Day Program, Harrington, DE. For more information, contact Cory Whaley at 302-856-7303 or by email whaley@udel.edu or Richard Taylor at 302-545-2395 or by email rtaylor@udel.edu

January 16, 2014
Tri-State Hay and Pasture Conference, Garrett County, MD (location to be announced). For more information, contact Willie Lantz at 301-334-6960 or by email wlantz@umd.edu

March 7-8, 2013
Maryland Cattle Industry Convention and Hay and Pasture Conference , Hager Hall Convention Center, Clarion Hotel, Hagerstown, MD. For more information, visit the Maryland Cattleman's Association web page at http://www.marylandcattle.org

Newsletter Web Address

The Regional Agronomist Newsletter is posted on several web sites. Among these are the following locations:

http://www.grains.cses.vt.edu/ Look for Mid-Atlantic Regional Agronomy Newsletter

or

www.mdcrops.umd.edu Click on Newsletter

Photographs for Newsletter Cover

To view more of Todd White's Bucks County photographs, please visit the following web site:

www.scenicbuckscounty.com