1764 A different approach in pedagogical model: Flipped classrooms. M. G. Maquivar[*1] and A. Ahmadzadeh[2], [1]*Department of Animal Sciences, Washington State University, Pullman,* [2]*University of Idaho, Moscow.*

New data indicate that undergraduate students are currently different from those 15 yr ago, their needs are different and they are more immersed in technological tools. As technology advances educators should learn more how to use these resources and pedagogical methodologies to enhance and promote active learning. Flipped classroom is a new pedagogical method developed to use different resources to create an environment where students take responsibility for their own learning. The end goal of this approach is to personalize learning and promote a more solid learning meeting the educational expectations of the new generation of undergraduate students. The concept of blended learning within flipped classrooms involves student participation through online or outside-classroom delivery of content and instruction that allows students to have some control over their time, effort, location and pace of delivery while using the traditional method of face-to-face classroom participation. The role of instructors in the classroom changes with the flipped classroom methodology, the faculty member is no longer the sole source of knowledge and information, instead, the instructor is a facilitator for students that allows students to take responsibility for much of their learning and knowledge attainment. The flipped classroom allows increasing interaction and personalized content time between students and faculty, promotes critical thinking, increase constructivist learning, engaged students in the course, and provides and incentives students to prepare for class. The adoption of this pedagogical approach is slow and the courses have to be well designed and carefully planned to avoid student frustration and dissatisfaction with the course, however, there is no doubt that flipped classroom and/or blended learning approaches addresses students learning needs.

Key Words: flipped classroom, personalized learning

1765 Teaching evaluations and other alternatives to assess good teaching and learning. K. G. Odde*, *Kansas State University, Manhattan.*

Animal Science departments have long strived for excellence in teaching. Quality teaching programs have been difficult to maintain because of reduced state funding, changing demographics of students, loss of livestock units that support teaching, and greater emphasis on extramurally funded research. Building and sustaining a culture whereby teaching receives respect similar to other mission areas is critical. Trends in higher education are toward "the research institution", since research is thought to drive more funding into the institution. However, the rapid increases in tuition rates in most institutions has made attracting students a high priority. Critical to building outstanding teaching programs is properly assessing teaching quality. The literature results on student evaluation of teaching as a tool for effectively evaluating and improving teaching are mixed. Some studies indicate that student evaluations can be useful and that results are positively correlated with learning, while others raise concerns about gender bias in student evaluations. Student evaluation of teaching is a useful tool, but has limitations. Peer evaluation of teaching can also be an effective tool in improving teaching quality.

Key Words: assessing teaching and learning, teaching evaluations

TOXIC PLANTS SYMPOSIUM

1766 Is there a difference between exposures to one or two plant toxins? K. D. Welch*, *USDA, ARS, Poisonous Plant Research Laboratory, Logan, UT.*

The majority of the plants in a given rangeland provide valuable forage for livestock species. However, plants that can poison livestock are very much a part of our rangelands. In this regard, most rangelands contain more than one poisonous plant. Frequently, much is known regarding the toxicity of individual plants and their effects on livestock. However, little is known regarding the effect of co-exposure to multiple toxic plants or even the effect of multiple toxins from an individual plant. Mixture toxicology, or the study of the co-exposure to multiple toxins, can result in additive, synergistic, or antagonistic effects. This presentation will highlight some of the recent research from the Poisonous Plant Research Lab wherein the effect of co-administering multiple plant toxins from the same plant and the effect of co-administration of different poisonous plants has been evaluated. A better understanding of the effect of co-exposure to multiple poisonous plants, and the mixture toxicology involved, will be useful in developing more beneficial management recommendations

for ranchers.

Key Words: cattle, death camas, larkspur, methyllycaconitine, mixture toxicology, multiple toxins, poisonous plants, sheep, zygacine

1767 Resistance to toxic plants: The right animal at the right time in the right pasture. B. T. Green[*1], K. D. Welch[1], J. W. Keele[2], T. G. McDaneld[2], and J. A. Pfister[3], *[1]USDA, ARS, Poisonous Plant Research Laboratory, Logan, UT, [2]USDA, ARS, U.S. Meat Animal Research Center, Clay Center, NE, [3]USDA ARS Poisonous Plant Research Laboratory, Logan, UT*

Neurotoxic poisonous plants negatively impact livestock on many western rangelands, which results in annual economic losses of millions of dollars from animal deaths, increased management and treatment costs, and if animals are deferred from grazing, the underutilization of otherwise highly nutritious pastures and rangelands. One potential solution to the problem of toxic plants is to identify and select animals that are "resistant" to neurotoxic plants. Research at the Poisonous Plant Research Laboratory (PPRL) has focused on the physiological effects of two plant species, larkspur (*Delphinium* spp.) and lupine (*Lupinus* spp.). There are significant differences in the susceptibility of cattle breeds to larkspur and lupine. For example, when Angus and Hereford cattle were orally dosed with 8 mg/kg d-(methylsuccinimido) anthranoyllycoctonine (MSAL)-type alkaloids in the form of dried ground larkspur, Angus were significantly more resistant to the larkspur-induced fatigue ($P < 0.0001$, Two-tailed *t* test, 33 Angus versus 48 Line 1 Herefords). Breed differences have also been observed for lupine which causes birth defects in cattle by the inhibition of fetal movement. For example, when six pregnant Angus and five pregnant Holstein heifers were orally dosed with 1.1 g/kg dried ground *Lupinus leucophyllus* and fetal activity monitored via transrectal ultrasonography, there were significantly more fetal movements in Holstein heifers at eight and 12 h after oral dosing than the Angus heifers ($P = 0.0430$ and 0.0001 for eight and twelve hours after oral dosing, respectively, linear mixed model analysis). These results provide the basis for phenotypes, which can then be used in the development of a genetic test to facilitate selection of resistant animals, which can then be used to manage the risk of toxic plants.

Key Words: cattle, d-(methylsuccinimido) anthranoyllycoctonine, larkspur, lupine,

1768 Using divergent selection and genomics to uncover genetic variation underlying larkspur tolerance and susceptibility in cattle. J. W. Keele[*1], T. G. McDaneld[1], L. A. Kuehn[1], W. M. Snelling[1], R. G. Tait, Jr.[1], K. D. Welch[2], and B. T. Green[2], *[1]USDA, ARS, U.S. Meat Animal Research Center, Clay Center, NE, [2]USDA, ARS, Poisonous Plant Research Laboratory, Logan, UT.*

In the Rocky Mountain region of western US, selection for larkspur tolerance would reduce mortality of cattle from larkspur poisoning and increase opportunity to utilize pastures at peak nutrient availability resulting in increased sustainability of beef production. Previous research indicated that there are breed differences for tolerance to toxic larkspur. Our objective was to estimate heritability for larkspur tolerance within breed and evaluate the potential for increasing larkspur tolerance through artificial selection. Larkspur challenge was administered to 141 yearling steers (32 Angus, 13 Brahman, 49 Line 1 Hereford, 33 Holstein, and 14 Jersey) with a standardized dose of dried ground larkspur suspended in water and gavaged directly into the rumen. Larkspur tolerance was measured at 24 h after dosing as the length of time (up to 40 min maximum) in which the animal could sustain walking at 6.44 km/h while being led behind a tractor on a circular track. High-density SNP arrays (770,000 or 30,000 SNP) were used to genotype each steer and genotypes were used to compute the genomic relationship matrix which is a precursor to estimating heritability. Larkspur tolerance heritability estimates were similar whether estimated with REML (0.36 ± 0.30; $P = 0.10$) or Bayesian Monte Carlo Markov chain (MCMC) (0.42 ± 0.23; MCMC posterior distribution 2.5, 25, 50, 75, and 97.5th percentiles were 0.035, 0.24, 0.40, 0.59, and 0.90). To evaluate the potential for using our larkspur challenge data to calculate EBV of an untested population, we computed genomic relationship coefficients between 190 previously genotyped (but untested for larkspur tolerance and comprising the same 5 breeds in this study) cattle and the 141 steers tested for larkspur tolerance. Because of uncertainty in the heritability estimate, EBV were computed for each iteration of the MCMC to average over all possible values for heritability and weight by the appropriate posterior density. The most extreme EBV were for target animals with the strongest genetic ties to tested animals. Simulations indicated that divergent selection of parents can more than double the power for estimating heritability. Our results indicate that selection for larkspur tolerance should be effective. The rate of selection response will critically depend on challenging and testing animals with strong genetic ties to candidates for selection. Genetic ties can either be estimated from SNP genotypes or computed from common ancestry. USDA is an equal opportunity provider and employer.

Key Words: cattle, larkspur, plant toxins

1769 The relationship between swainsonine-containing plants and endophytic fungi. D. Cook*, D. R. Gardner, and J. A. Pfister, *USDA, ARS, Poisonous Plant Research Laboratory, Logan, UT.*

Swainsonine, an indolizidine alkaloid with significant physiological activity, is an α-mannosidase and mannosidase II inhibitor that alters glycoprotein processing and causes lysosomal storage disease. Swainsonine is present in a number of plant families worldwide including the Convolvulaceae, Fabaceae, and Malvaceae and causes severe toxicosis in livestock grazing these plants. The three families of swainsonine containing plants are represented by six genera of plants: *Ipomoea*, *Turbina*, *Astragalus*, *Oxytropis*, *Swainsona*, and *Sida*. Two families of fungal endophytes, Pleosporaceae and Chaetothyriaceae, that produce swainsonine have been isolated from the Fabaceae and Convolvulaceae swainsonine-containing plants, respectively. Data will be presented in regard to these plant endophyte relationships. Additionally data will be presented characterizing this interaction and the influence of environment and genotype in determining swainsonine concentrations in planta. Furthermore we will present data further exploring the diversity of plants containing swainsonine and their associated endophytes.

Key Words: locoweed, morning glory, swainsonine,

1770 Alleviation and mitigation of fescue toxicosis. G. E. Aiken*, *USDA-ARS, Forage-Animal Production Research Unit, Lexington, KY.*

Tall fescue (*Lolium arundinaceum* L.) is a cool-season perennial grass that is utilized as a forage on approximately 16 million hectares of the USA, primarily in the transition zone between the temperate northeast and subtropical southeast. A fungal endophyte (*Epicloë coenophialia*) that infects most plants of the most widely grown cultivar, Kentucky 31 produces alkaloids that impart the plant with tolerances to environmental stresses, but also produces ergot alkaloids that causes a toxicosis. The signs of "fescue toxicosis" include maintaining rough hair coats during the summer, elevated body temperature, labored respiration, and decreased prolactin concentrations. Ergot alkaloids bind α adrenergic receptors in peripheral vasculature of ruminants that disrupts thermoregulation and makes them vulnerable to severe heat stress at onset of moderate air temperatures. Calf weight gain can be very low on toxic tall fescue, which has limited the use of fescue for stocker production. Although the grass is primarily used for cow-calf production, calving percentages, milk yields, and weaning weights can be reduced on toxic endophyte-infected tall fescue. Non-toxic endophyte tall fescues have been commercially released that demonstrate to alleviate fescue toxicosis. Other technologies, such as chemical seedhead suppression, feeding soy hulls, and overseeding with red clover also have shown to mitigate fescue toxicosis. Evaluations of the efficacy of these new technologies in enhancing cattle performance and well-being on toxic endophyte-infected tall fescue will be presented and discussed.

Key Words: endophytes, *Epicloë coenophialia*, fescue toxicosis, *Lolium arundinaceum*, tall fescue

1771 Effects of high selenium forages on reproduction in sheep. Z. Davis*, *ARS USDA, Logan, UT.*

High Se-containing forages grow on seleniferous soils in many parts of world and can cause acute or chronic selenosis in livestock. Anecdotal reports of decreased reproductive rates in livestock grazing seleniferous forages have been reported and it has been speculated that reproductive failure is one of the initial changes of Se poisoning. However, there is very limited if any information in the literature on the effects on selenium on reproduction in livestock. The objective of this research was to determine the effect of high Se forages on reproduction in ewes and rams. Ewes were randomly divided into three groups (n = 10) and fed a control alfalfa pellet (< 0.3 ppm Se) or a high Se-containing alfalfa pellet that contained either 10 or 30 ppm Se for 12 wk. Feeding of the pellets began 6 wk before exposing the ewes to rams. Each ewe was exposed to two rams twice each day for two complete reproductive cycles. After the first cycle, significantly (P < 0.05) more ewes were pregnant in the control group (10/10) than in the 10 ppm Se (6/10) and 30 ppm Se (6/10) groups. After a second cycle 9/10 and 6/10 were pregnant in the 10 and 30 ppm Se groups, respectively. In a second study rams were randomly divided into two groups (n = 10) were they were fed either a control alfalfa pellet (containing < 0.3 ppm Se) or a high Se-containing alfalfa pellet (~25 ppm Se) for twelve weeks during which time semen samples were collected weekly. After twelve weeks of being fed high Se pellets, one testicle from each ram was surgically removed, the rams were then fed a control alfalfa pellet diet (containing < 0.3 ppm Se) and allowed to recover for 8 wk at which time the second testicle was surgically removed for histological analysis. Rams fed the high Se-containing alfalfa pellet had a decrease in sperm motility and an increase in the percentage of abnormal sperm. These negative effects were reversed after the rams were fed the regular alfalfa pellets for 8 wk. None of the sheep in either study demonstrated any clinical signs of Se poisoning during the study. In summary, high selenium feeds negatively affect reproduction in both ewes and rams.

Key Words: reproduction, selenium, sheep