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Statistics Used in the Nebraska Beef Report and Their Purpose

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Statistics Used in the Nebraska Beef Report and Their Purpose

The purpose of beef cattle and beef product research at UNL is to provide reference information that represents the various populations (cows, calves, heifers, feeders, carcasses, retail products, etc.) of beef production. Obviously, researchers cannot apply treatments to every member of a population; therefore, they must sample the population. The use of statistics allows researchers and readers of the *Nebraska Beef Report* the opportunity to evaluate separation of random (chance) occurrences and real biological effects of a treatment. Following is a brief description of the major statistics used in the beef report. For a more detailed description of the expectations of authors and parameters used in animal science, see *Journal of Animal Science Style and Form* (beginning pp. 339) at *http://jas.fass.org/misc/ifora.shtml*.

- **Mean** — Data for individual experimental units (cows, steers, steaks) exposed to the same treatment are generally averaged and reported in the text, tables and figures. The statistical term representing the average of a group of data points is *mean*.

- **Variability** — The inconsistency among the individual experimental units used to calculate a mean for the item measured is the variance. For example, if the ADG for *all* the steers used to calculate the mean for a treatment is 3.5 lb, then the variance is zero. But, this situation never happens! However, if ADG for individual steers used to calculate the mean for a treatment ranges from 1.0 lb to 5.0 lb, then the variance is large. The variance may be reported as standard deviation (square root of the variance) or as standard error of the mean. The standard error is the standard deviation of the mean as if we had done repeated samplings of data to calculate multiple means for a given treatment. In most cases treatment means and their measure of variability will be expressed as follows: 3.5 ± 0.15. This would be a mean of 3.5 followed by the standard error of the mean of 0.15. A helpful step combining both the mean and the variability from an experiment to conclude whether the treatment results in a real biological effect is to calculate a 95% confidence interval. This interval would be twice the standard error added to and subtracted from the mean. In the example above, this interval is 3.2-3.8 lb. If in an experiment, these intervals calculated for treatments of interest overlap, the experiment does not provide satisfactory evidence to conclude that treatment effects are different.

- ***P* Value** — Probability (*P* Value) refers to the likelihood the observed differences among treatment means are due to chance. For example, if the author reports $P \leq 0.05$ as the significance level for a test of the differences between treatments as they affect ADG, the reader may conclude there is less than a 5% chance the differences observed between the means are a random occurrence and the treatments do not affect ADG. Hence we conclude that, because this probability of chance occurrence is small, there must be difference between the treatments in their effect on ADG. It is generally accepted among researchers when *P* values are less than or equal to 0.05, observed differences are deemed due to important treatment effects. Authors occasionally conclude that an effect is significant, hence real, if *P* values are between 0.05 and 0.10. Further, some authors may include a statement indicating there was a "tendency" or "trend" in the data. Authors often use these statements when *P* values are between 0.10 and 0.15, because they are not confident the differences among treatment means are real treatment effects. With *P* values of 0.10 and 0.15, the chance random sampling caused the observed differences is 1 in 10 and 1 in 6.7, respectively.

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- **Linear and Quadratic Contrasts —** Some articles refer to linear (L) and quadratic (Q) responses to treatments. These parameters are used when the research involves increasing amounts of a factor as treatments. Examples are increasing amounts of a ration ingredient (corn, byproduct, or feed additive) or increasing amounts of a nutrient (protein, calcium, or vitamin E). The L and Q contrasts provide information regarding the shape of the response. Linear indicates a straight line response and quadratic indicates a curved response. *P*-values for these contrasts have the same interpretation as described above.

- **Correlation (r) —** Correlation indicates amount of linear relationship of two measurements. The correlation coefficient can range from –1 to 1. Values near zero indicate a weak relationship, values near 1 indicate a strong positive relationship, and a value of –1 indicates a strong negative relationship.

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Animal Science

http://animalscience.unl.edu

Curriculum – The curriculum of the Department of Animal Science at the University of Nebraska–Lincoln is designed so that each student can select from a variety of options oriented to specific career goals in professions ranging from animal production to veterinary medicine. Animal Science majors can also easily double major in Grazing Livestock Systems (*http://gls.unl.edu*) or complete the Feedlot Management Internship Program (*http://feedlot.unl.edu/intern*). Another expanding educational experience is the ***Nebraska Beef Industry Scholars Program,*** a unique four year certification program for UNL students.

Careers:

Animal Health
Animal Management
Banking and Finance
Consultant
Education
Marketing
Meat Processing
Meat Safety
Quality Assurance
Research and Development
Technical Service
Veterinary Medicine

Scholarships – Thanks to the generous contributions of our supporters listed below, each year the Animal Science Department offers scholarships to incoming freshmen and transfer students, as well as students at the sophomore, junior, and senior level within the UNL Animal Science Program. For the 2011-2012 academic year, over $33,000 in scholarships were awarded to incoming freshmen and transfer students, and over $58,000 in scholarships were awarded to upperclass UNL Animal Science students.

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