Attachment A

RESEARCH PROPOSAL TO THE AGRICULTURAL RESEARCH FOUNDATION FOR 2011 COMPETITIVE GRANT PROGRAM

TITLE: Effects of disposition and acclimation to human handling on feedlot performance and carcass characteristics of feeder steers.

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PROPOSAL:

Justification: The Oregon beef industry is mainly composed of cow-calf operations, and represents the largest agriculture commodity in the state. The main goal of cow-calf systems is to produce healthy and vigorous calves that are transferred to feedlots after weaning for further growth, finishing, and subsequent harvest. Nowadays, many cow-calf producers retain ownership of feeder calves during the feedlot phase; therefore feedlot performance, efficiency, and carcass quality of these calves determines the profitability of many cow-calf and feedlot producers in Oregon.

For over a century, disposition has been defined as the behavioral responses of cattle when exposed to human handling. As cattle disposition worsens, their response to human contact or any other handling procedures becomes more aggressive and excitable. Cattle disposition has been shown to be detrimental not only to personnel safety, but also to productivity of beef operations. More specifically, recent studies have demonstrated that excitable disposition is extremely detrimental to reproductive performance beef females (Cooke et al., 2010), and research studies are currently being conducted at the EOARC-Burns, with financial support from the Agricultural Research Foundation, to further investigate this topic.

However, the deleterious effects of excitable disposition in cattle are not limited to reproduction. Previous research reported that feedlot calves with excitable disposition have decreased growth rates compared to calm cohorts (Voisinet et al., 1997a). These outcomes can be mainly attributed to reduced feed intake because temperamental cattle spend more time inspecting their surroundings and reacting against “threats” instead of consuming their diets. Also, disposition has detrimental effects on carcass quality (Voisinet et al., 1997b). Previous research has shown that excitable disposition decreases final carcass weight, carcass yield grade, and meat tenderness, whereas it increases percentage of bruised and dark carcasses. These effects can be mainly attributed to reduced growth rates and altered metabolism that temperamental cattle experience during the feedlot. However, all the research studies

associating disposition and feedlot performance evaluated calves originated from cowherds maintained in drylot and intensive systems, which are highly different in terms of overall disposition compared to the herds maintained in Oregon's extensive rangeland scenarios. Also, all the research studies associating disposition and carcass quality only evaluated *Bos indicus* cattle, and similar studies should be conducted with *Bos taurus* cattle, which commonly exhibit excitable disposition and represent the majority of calves in the Oregon and U.S. beef industry.

There are two main strategies that could potentially improve disposition and consequent productivity of feeder calves. The first is to select the cowherd for calm disposition, which should benefit future calf crops given that this trait is significantly heritable. Second, recent studies from our research group, supported by the Agricultural Research Foundation, demonstrated that acclimation of young cattle to human handling improves their disposition and consequent future productivity (Cooke et al., 2010). However, this method was only tested with replacement heifers by evaluating their reproductive development. Therefore, acclimation to human handling might also be a feasible alternative to improve disposition of feeder calves, and consequently enhance their feedlot performance and carcass quality.

Based on this information, we hypothesize that excitable disposition impairs feedlot performance and carcass quality of feeder calves originated from the Oregon beef industry, and acclimation to human interaction after weaning will improve their disposition and consequent feedlot productivity. At the completion of this research, we expect to have demonstrated that: 1) disposition is an important trait affecting feedlot productivity and should be included as a selection/culling criteria for the cowherd due to its heritability, and 2) acclimation to human handling can be adopted by Oregon cow-calf operations, such as during preconditioning programs, as a beneficial strategy to improve disposition and enhance feedlot performance and carcass quality of feeder steers.

Literature Cited:

Cooke, R. F., and D. W. Bohnert. 2010. Effects of acclimation to handling on performance, reproductive, and physiological responses of replacement beef heifers. BEEF 045 In: 2010 Oregon Beef Council Report, pp 6-9. Available at: http://beefcattle.ans.oregonstate.edu/html/publications/documents/BEEF045HeiferAcclimation.pdf.

Voisinet, B. D., T. Grandin, J. D. Tatum, S. F. O'Connor and J. J. Struthers. 1997a. Feedlot cattle with calm temperaments have higher average daily gains than cattle with excitable temperaments. J Anim Sci. 75:892-896.

Voisinet, B. D., T. Grandin, S. F. O'Connor, J. D. Tatum, and M. J. Deesing. 1997b. Bos indicus-cross feedlot cattle with excitable temperaments have tougher meat and a higher incidence of borderline dark cutters. Meat Sci. 46:367-377.

Objectives: This study will be divided into two experiments. The objective of experiment 1 is to determine the effects of disposition on feedlot performance and carcass quality of feeder steers originated from a typical Oregon cow-calf operation. The objectives of experiment 2 are to compare disposition, blood measurements associated with behavioral stress response, feedlot performance, and carcass characteristics of feeder calves exposed or not to handling acclimation procedures after weaning.

Procedures:

Experiment 1 - The proposed study will be conducted at the EOARC - Burns, which has all of the equipment, resources, and personnel necessary to complete this research in a timely fashion. One hundred and fifty calves (steers and heifers) will be weaned at 7 months of age (September 2011), and maintained at the EOARC for approximately 30 days for preconditioning

prior to shipping to a commercial feedlot (Beef Northwest; Boardman, OR), where they will remain until slaughter (July 2012). All calves will be managed similarly prior to weaning, during preconditioning, and at the feedlot. At weaning and immediately prior to shipping to the feedlot, all steers will be sampled for blood and evaluated for disposition. Blood samples will be analyzed for plasma concentrations of cortisol (stress hormone) and inflammatory proteins (stress markers), whereas disposition will be assessed by chute score and chute exit velocity (Cooke et al., 2010). This sampling schedule was adopted because cow-calf producers can only manage disposition of feeder calves when these are at the cow-calf ranch, given that at the feedlot, calves are mixed with other animals, exposed to different management procedures, and any changes in their disposition cannot be accredited to the cow-calf phase. During the feedlot phase until slaughter, mortality and morbidity incidences will be monitored monthly. Steer body weight gain will be calculated using values obtained at weaning, shipping, and slaughter. Steers will be harvested at a commercial packing facility (Tyson Fresh Meats, Pasco, WA). The following carcass characteristic will be obtained 24 h post-harvest: USDA Yield Grade, hot carcass weight, 12^{th}-13^{th} rib adjusted fat thickness, longissimus area, KPH%, USDA Quality Grade, and USDA marbling score. Dark cutting will be scored for severity in units corresponding to quality grade discounts (no discount, 1/3, 2/3, and full grade discount). Carcass bruises will be assessed based on the number (0, 1, 2, 3, 4, and 5 or more), location (round, loin, rib, chuck, and flank plate or brisket), and severity (minor, major, critical, and extreme). Final carcass value will be assessed based on the aforementioned carcass traits and contemporary beef prices. Immediately after the completion of the study, results will be analyzed, summarized, integrated into beef cattle extension material, and reported into popular press and scientific publications.

Experiment 2 - The proposed experiment will divided into an acclimation phase (day -30 to 0), a growing phase (day 1 to 60), and a feedlot phase (day 61 to slaughter). The acclimation and growing phases will be conducted at the EOARC, Burns. The feedlot phase will be conducted at a commercial feedyard (Beef Northwest; Boardman, OR). These facilities have all of the equipment, resources, and personnel necessary to complete this research in a timely fashion.

Sixty Angus × Hereford steers will be weaned at 7 months of age (September 2011; day -45), and utilized in this experiment. For the acclimation phase, weaned steers will be initially evaluated for body weight and disposition (according to chute score and chute exit velocity) on day -30, stratified by these variables, and randomly assigned to receive or not (control) the acclimation treatment. Steers will be maintained on separate meadow foxtail (*Alopecurus pratensis* L.) pastures according to treatment, and will receive supplemental meadow foxtail hay and concentrate 3 times weekly to sustain a growth rate of approximately 1 pound per day. The acclimation process (day -30 to 0) will consist of bringing assigned steers to the cattle working facility three times weekly, where steers will be exposed to common handling practices, and will be returned to pasture within two hours. Control steers will remain undisturbed on pasture. This is the same acclimation treatment assigned to heifers in our previous research study funded by the Agricultural Research Foundation which successfully improved heifer disposition and development (Cooke et al., 2010). In addition, during feeding procedures, the technician will walk among steers assigned to the acclimation treatment for 15 minutes to further expose them to human interaction, whereas the same procedure will not be applied to control steers.

On the morning of day 0, all steers will be combined into one group, loaded into a commercial livestock trailer, transported for 24 h, and returned to a feeding facility at the EOARC (day 1). This transportation process will be applied to steers in order to simulate the stress of a long-haul, which is common to calves originated from the Oregon beef industry and may complement the detrimental effects of disposition on cattle performance. During the growing phase (day 1 to 60), steers will be stratified by body weight and disposition, and randomly allocated according to treatments into 20 drylot pens (10 pens/treatment; 3 steers/pen). All pens will receive 5 pounds/steer daily of a concentrate, whereas meadow foxtail

hay will be offered in amounts to ensure ad libitum access. Hay and concentrate intake will be assessed daily by measuring refusals. On day 61, steers will be again loaded into a commercial livestock trailer, and transported for 8 h to the commercial feedyard (Beef Northwest) where they will remain until slaughter (July 2012). During the feedlot phase, all steers will be maintained in a single pen, managed similarly, and will receive the same diet.

Blood samples will be collected on day -30 (beginning of the acclimation phase), day 0 (at the end of the acclimation phase, prior to loading), day 1 (immediately upon arrival), and days 4, 8, 15, 22, 30, 45, and 60 (one day prior to loading). Blood samples will be analyzed for cortisol (stress hormone), inflammatory proteins (stress markers), and IGF-I (hormone associated with growth). Steer body weight gain will be calculated using shrunk values obtained on day -30, day 1, day 60, and at slaughter. Steer disposition will also be obtained on day 0 and 60 to evaluate treatment effects. Feed intake, feed efficiency, and health conditions will be monitored daily during the growing phase (day 1 to 60). During the feedlot phase until slaughter, mortality and morbidity incidences will be monitored monthly. Steers will be harvested at a commercial packing facility (Tyson Fresh Meats, Pasco, WA). The following carcass characteristic will be obtained 24 h post-harvest: USDA Yield Grade, hot carcass weight, 12^{th}-13^{th} rib adjusted fat thickness, longissimus area, KPH%, USDA Quality Grade, and USDA marbling score. Dark cutting will be scored for severity in units corresponding to quality grade discounts (no discount, 1/3, 2/3, and full grade discount). Carcass bruises will be assessed based on the number (0, 1, 2, 3, 4, and 5 or more), location (round, loin, rib, chuck, and flank plate or brisket), and severity (minor, major, critical, and extreme). Final carcass value will be assessed based on the aforementioned carcass traits and contemporary beef prices

Upon the completion of the study, an economical analysis will be performed to contrast the effects of acclimation on steer performance with the additional costs associated with the acclimation procedure, such as labor and equipment. All results will be immediately analyzed, summarized, integrated into beef cattle extension material, and reported in popular press and scientific publications.

Duration of study: September 2011 to July 2012