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Use of Expected Progeny Difference (EPD) Information to Estimate Maximum Bid Price for Purchased Beef Bulls

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Abstract

A pricing model was developed using expected progeny difference information for weaning-weight (WW-EPD) to predict the maximum bid price for a bull considered for purchase. The utility of this pricing model should appeal most to veterinarians working closely with their clients on other bull management issues.

To complete the pricing model, buyer-specific data were needed for two bulls: a reference bull and a bull being considered for purchase (prospect bull). Data input included a base sale price ($) for the reference bull, the WW-EPD advantage for the prospect bull over the reference bull, expected body weight (lb) and price ($/per hundred weight [cwt]) at time of culling for both bulls, and the number of breeding seasons used. Cow-to-bull ratio used, weaning percentage of each calf crop, mean age (months) of calves at weaning, income tax rate (%), discount (interest) rate (%), average price ($/cwt) expected for each calf crop sold, shrink (%) and price slide ($/cwt) were also required to complete the pricing model.

Output values generated by the pricing model were initially organized into an income statement summarizing the increased after-tax net income earned from each calf crop produced by the prospect bull over the reference bull for each year of bull use. Income statement information was then transformed into a cash flow statement. Cash flow for each year was transformed into its present value. All present values were summed, and then added to the purchase price used for the reference bull to establish the recommended maximum bid price for the prospect bull.

Inaccurate input values will reduce the effectiveness of the pricing model as a tool for informed decision-making. Veterinarians who use this pricing model to help their clients value bulls will find that cow-to-bull ratio, number of breeding seasons that a bull is used, and weaned calf crop percentage are the primary factors influencing the premium that can be paid for the prospect bull over the reference bull.

Résumé

Un modèle d'achat a été développé sur la base de l'information sur la différence attendue de progéniture par rapport au poids au sevrage (WW-EPD) pour prédire le prix maximum à l'encan dans l'achat d'un taureau. Le modèle d'achat devrait être pertinent pour les vétérinaires qui travaillent présentement avec leurs clients sur d'autres aspects de la gestion des taureaux.

Pour compléter le modèle d'achat, des données spécifiques à l'acheteur ont été requises pour deux types de taureaux : un taureau de référence et un taureau considéré pour l'achat (taureau candidat). Les données incluaient le prix de base ($) pour le taureau de référence, l'avantage en terme de WW-EPD du taureau candidat par rapport au taureau de référence, le poids moyen attendu (lb) et le prix ($ par unité de 100 livres de poids [cwt]) au moment de l'abattage pour les deux types de taureaux et enfin le nombre de saisons de reproduction prévues. Il était aussi nécessaire d'avoir de l'information sur les paramètres suivants pour finaliser le modèle : le rapport vache/taureau utilisé, le pourcentage moyen de veaux sevrés pour chaque groupe de veaux produits, l'âge moyen des veaux (mois) au

sevrage, le taux d'imposition (%), le taux (intérêt) d'escompte (%), le prix moyen ($/cwt) attendu pour chaque groupe de veaux vendus, le pourcentage de dévaluation et la dérive des prix ($/cwt).

Les valeurs prédites par le modèle d'achat ont été organisées initialement sous la forme d'un rapport mettant en valeur l'augmentation des revenus nets après déduction obtenus suite à la vente des groupes de veaux produits par le taureau candidat par rapport au taureau de référence à chaque année d'utilisation du taureau. Cette information a ensuite été transformée sous la forme d'un rapport de capacité d'autofinancement. La capacité d'autofinancement a été transformée en valeurs actuelles. Les valeurs actuelles ont été additionnées et ajoutées au prix d'achat du taureau de référence pour établir le prix recommandé à l'encan pour le taureau candidat.

L'utilisation de valeurs inadéquates pour les paramètres libres réduira l'efficacité du modèle dans l'aide à la prise de décision. Les vétérinaires qui utilisent le modèle d'achat pour aider leurs clients à évaluer les taureaux se rendront compte que le rapport vache/taureau, le nombre de saisons de reproduction prévues pour le taureau et le pourcentage de veaux sevrés par groupes de veaux sont les paramètres qui influencent le plus la valeur additionnelle que l'on peut payer pour le taureau candidat par rapport au taureau de référence.

Introduction

As an industry, commercial beef production continues to be a commodity whereby ranchers are generally "price-takers". Realistically, little influence can be exerted over prices received, and thus the revenue from any calves sold. Consequently, sustainability of beef production for a cow-calf enterprise is predicated most on reducing overall unit cost of production, while simultaneously maintaining a high weaned calf crop percentage, and increasing the pounds of calf weaned per cow.

Obviously, weaning weight is a very important economically relevant trait in beef cattle, second only to reproductive performance.[7] The greater the total pounds produced from a calf crop, the lower the break-even price will become for the cow-calf enterprise.[7]

Bull selection is arguably the most important management decision impacting pounds of calf produced per cow. A bull contributes one-half of the genes for growth in calves sired by him, and one-quarter of the genes for growth in any calves subsequently born to his daughters retained as replacements.[10] Consequently, 80-90% of genetic improvement in a cow herd comes from the bull battery used.

Historically, cattle producers have used visual appraisal, pedigree analysis, in-herd performance ratios and estimated breeding values to guide their bull selection process,[11] as well as to justify the price paid for a bull. However, none of these methods have been helpful in validating whether the additional money spent on one bull over another was actually recouped.

Fortunately, expected progeny difference (EPD) information provides an objective genetic method of predicting how one bull's offspring will perform for a particular trait compared to offspring produced by another bull.[11] Due to widespread use of this genetic selection tool by all major beef breed associations, it is common to have EPD information available on bulls offered for sale by seedstock producers in the United States.

The goal of the authors is to describe a simple pricing model, based upon weaning-weight EPD, that can be used to value bulls considered for purchase. The utility of this pricing model should appeal most to veterinarians working closely with their clients on other bull management issues, such as ensuring ongoing reproductive and overall health soundness, maintaining adequate body condition and selecting replacement bulls for calving ease. Using this pricing model to help a client value bulls should be another positive signal to him/her that you, as a veterinarian, are interested in their sustainability in beef production.

Pricing Model Data Requirements

Bull-specific data – In order to complete the pricing model, data were needed for two bulls: the bull being considered for purchase (prospect bull) and a reference bull. Required data included an expected progeny difference for weaning-weight (WW-EPD) for both bulls, an expected body weight (lb) and price (dollars per hundred weight; $/cwt) at culling (salvage) for both bulls, a base sale price ($) for the reference bull, and the number of breeding seasons (yrs) the prospect bull will be used.

The pricing model assumed that the WW-EPD for the reference bull represented the average of the WW-EPDs for the entire offering of bulls. A relative base sale price, matched to the WW-EPD, for the reference bull should come from previous sales summaries when possible. If the seller does not have (or will not provide) this information, a realistic base price must be estimated during the course of an actual bull sale, or arbitrarily set. An arbitrary base price for a particular breed of bull can be established by contacting the respective breed association herd registry office and requesting a summary of the average prices paid for bulls during the previous year. Sorting of these animals by WW-EPD may also be possible.

The pricing model also allows a producer to enter optional information pertaining to any unique recurring cost (e.g. mortality insurance, additional supplemental feed) credited specifically to the prospect bull, but not

the reference bull. A cost for the presumed increased nutritional needs of higher gaining calves sired by the prospect bull can also be inserted into the pricing model. The portion of gain associated with this additional cost was assumed to be the time period after 90 days of age and until weaned,[10] when calves typically transition from purely a milk diet to one of grass supplemented with milk. The cost ($/lb gain) relates to pasture utilization by these calves.

The pricing model accommodates up to six breeding seasons of bull use. Most commercial beef cow-calf enterprises are likely, however, to cull bulls after only 3, 4, or 5 breeding seasons.

Cowherd-specific data—Input of specific production data from the buyer's cow herd is required to complete the pricing model, including an expected cow-to-bull ratio, weaning percentage of each calf crop and average age (months) of calves at weaning. Adhering to Cow-Calf Standardized Performance Analysis (SPA) definitions,[15] weaned percentage of calf crop is based on actual number of calves weaned divided by the number of cows exposed to bulls at the start of the breeding season. Cow-to-bull ratio is also based on the number of cows exposed to each bull at the start of the breeding season.

Supporting financial and marketing data—Miscellaneous financial data needed to complete the model includes a marginal income tax rate (%), a discount rate (%), and the average price expected for each calf crop at marketing ($/cwt). Shrink (%) and a price slide ($/cwt) are included in the pricing model as standard aspects of marketing.

Pricing Model Design

The framework of the pricing model is organized into 1) input values, 2) output values, and 3) a sensitivity analysis (Table 1). An electronic spreadsheet[a] manipulates the data and performs the calculations.

Input values

The input values shown in the pricing model (Table 1) are arbitrary numbers for illustrative purposes only, in order to demonstrate the key features of the pricing model. Every client will have a unique set of input values.

Production information—Each producer must provide their own production values to complete the pricing model. Bull-specific and cow herd-specific production information must be entered manually into the boxed cells in the top section of the model. If purely arbitrary numbers are entered into the pricing model, any bid price subsequently generated from these numbers will be worthless to guide bull-buying decisions. Therefore, beef producers must maintain good production records in order to provide valid input numbers. The pricing model cannot be used as a tool to value bulls if the producer knows nothing about his/her actual production characteristics.

Financial and marketing information—Most financial and marketing information required to complete the pricing model will not be readily apparent to a commercial beef cow-calf producer, but is accessible from third parties. Information on average calf prices ($/cwt) to use for each calf crop can be obtained from state and federal livestock marketing agencies or private marketing sources.[5]

Shrink is a loss of body weight affecting live cattle,[8] typically due to fecal, urine and rumen fill losses as cattle move through marketing channels. Feeder cattle commonly shrink from 2 to 8%.[8]

Lighter-weight calves command a progressively higher price ($/cwt) at market than similar quality, heavier weight calves. To account for this, a price slide ($/cwt) is included in the model. A standard price slide does not exist, but depends upon market conditions. Local auction markets and state and federal livestock marketing agencies are a source of current and historical price information for the various weight categories of calves, and offer advice regarding what a realistic price slide should be for the weight, frame size and muscle score of calves typically sold by a producer.

The discount rate used in the pricing model will undoubtedly vary between producers. The rate used should equal the percentage return on investment that an individual producer desires for investment alternatives in the capital market. After all, a bull is considered a capital asset, and money spent to purchase him is considered an investment activity of the cow-calf enterprise.

A producer may have historical information on grazing costs for calves and cull prices for bulls that can be used in the pricing model. However, if a representative price is not known for bulls, local auction markets and state and federal livestock marketing agencies can provide this information. Grazing costs for suckling calves are difficult to ascertain, therefore the authors suggest that a producer use a conservative estimate of $0.50 per pound gain.

Output values

Output values are automatically calculated from the input data and presented in the middle section of the model (Table 1). An income statement is presented first. It summarizes the predicted present value of after-tax net income for each calf crop produced by the

Table 1. Pricing model for determining the recommended maximum bid price for purchased beef bulls.

Input Values					
First year of bull use	2003				
Expected purchase price of reference bull ($)	$1,500				
Expected weight of reference bull at time of culling (lb)	2000				
Expected price of reference bull at time of culling ($/cwt)	$45.00				
Salvage value of reference bull ($)	$900				
Wean wt. EPD advantage for prospect bull (lb)	20.00				
Added miscellaneous cost occuring each year for prospect bull (e.g. Mortality insurance)	$0.00				
Expected weight of prospect bull at time of culling (lb)	2000				
Expected price of prospect bull at time of culling ($/cwt)	$45.00				
Salvage value of prospect bull ($)	$900				
Number of breeding seasons a bull will be used (yr)	4				
Number of cows per bull (hd)	20				
Weaned calf crop (%)	83.00%				
Calf shrink at marketing (%)	6.00%				
Price slide ($/cwt)	$4.00				
Grazing cost per pound of calf weight gain ($/lb)	$0.50				
Average age of calf at weaning (months)	7.0				
Discount rate (%)	10.00%				
Income tax rate (%)	25.00%				
Breeding season	1	2	3	4	
Calendar year of calf sale	2004	2005	2006	2007	
Additional wean wt of calves from prospect bull (lb)	312	312	312	312	
Average calf price ($/cwt)	$93.00	$95.00	$98.00	$101.00	
Average calf price adjusted for price slide ($/cwt)	$92.80	$94.20	$97.20	$100.20	
Output values					
Income statement					
Revenue					
Additional wean wt of calves from prospect bull	$288	$294	$303	$313	
Gain on sale of bull					
Expense					
Added costs that recur for prospect bull but not reference bull					
Added nutritional cost for calves of prospect bull	($89)	($89)	($89)	($89)	
Depreciation expense of prospect bull	($164)	($263)	($158)	($95)	
Loss on sale of bull				($142)	
Gross income before income tax	$34	($58)	$57	($13)	
Income tax	($9)	$14	($14)	$3	
After-tax net income	$26	($43)	$42	($10)	
Cash flow statement					
After-tax net income	$26	($43)	$42	($10)	
Depreciation expense	$164	$263	$158	$95	
Net cash inflow (outflow)	$190	$219	$200	$85	
Present value of cash inflow (outflow)	$173	$181	$150	$58	
Net present value of cash inflow (outflow)	$562				
Maximum bid price for prospect bull	$2,062				
Sensitivity analysis					
Interval of change in purchase price of reference bull ($/hd)	$500				
Interval of change in wean wt. EPD advantage of prospect bull (lb)	10.00				

Wean wt.	Purchase price ($)				
EPD (lb)	$500	$1,000	$1,500	$2,000	$2,500
0.00	$500	$1,000	$1,500	$2,000	$2,500
10.0	$781	$1,281	$1,781	$2,281	$2,781
20.0	$1,062	$1,562	$2,062	$2,562	$3,062
30.0	$1,343	$1,843	$2,343	$2,843	$3,343
40.0	$1,624	$2,124	$2,624	$3,124	$3,624

prospect bull. A cash flow statement is then generated from the income statement information for each year of bull use.

Income statement—The primary revenue item shown in the pricing model is the total additional weight produced from calves sired by the prospect bull versus those of the reference bull. The additional weight is a reflection of the WW-EPD advantage for the prospect bull entered into the pricing model. The primary expenses shown include any recurring miscellaneous cost(s) for the prospect bull, additional nutritional cost for calves sired by the prospect bull, and depreciation expense for him.

Depreciation expense is the proper accounting method to apportion the original cost of a productive long-term asset (such as a bull) to the periods in which benefits occur.[14] As an accounting procedure, depreciation expense is referred to as a *non-cash* expense, i.e. no out-of-pocket money is actually used each year to pay a bill for depreciation. Instead, it is a 'penciled-in' expense entry equivalent to the annual estimated decline in the potential usefulness (or value) of the capital asset due to ordinary wear and tear, natural deterioration from exposure to the elements, or technical obsolescence.[14] This is the application of the matching principle to long-lived assets. In financial reporting, the cost allocated to periods through the depreciation process is the asset's original historical cost minus its expected salvage value. The objective is to spread the original cost over the period of asset use. A Modified Accelerated Cost Recovery System (MACRS) depreciation schedule for 5-year property was used to estimate depreciation expense.[14] MACRS depreciation schedule places a zero salvage value on the asset. Therefore, depreciation expense for years one through six is determined by multiplying purchase price only by 20, 32, 19.20, 11.52, 11.52 and 5.76%, respectively.[14]

When long-lived assets are disposed of before their useful lives are completed, any difference between the net book value of the asset (its original cost minus accumulated depreciation expense) and the proceeds received when sold is treated as a gain or loss.[14] In financial reporting, gains and losses are considered non-cash items. If a gain is realized, the amount is presented as revenue, whereas if a loss is realized it is presented as an expense.

In the pricing model, a gain occurs if the difference between salvage value of the reference bull and the prospect bull, plus the difference in their respective accumulated depreciation, was greater than the difference in purchase price between the bulls. The amount of the gain is equivalent to this monetary difference. A bull must typically exhaust all MACRS depreciation expense in order to realize a gain, which is six years of bull ownership. In contrast, a loss occurs if the difference between salvage values of the bulls, plus the difference in their respective accumulated depreciation, was less than the difference in the purchase price between the bulls. The amount of loss is equivalent to this monetary difference. Bulls held less than six years will likely show a loss because MACRS depreciation of the asset has not been fully exhausted.

Cash flow statement—Because it is a non-cash item, depreciation expense for each year of bull use is added back to the associated net income to show the actual inflow (outflow) of cash produced for each production year (Table 1). Each of the yearly streams of net cash flow is then converted into its associated present value (PV) using the discounted cash flow formula, $PV = C_t / (1 + r_t)^t$, where C is each net cash flow, r is the discount rate (%), and t equals the number of the year corresponding to cash flow.[16] The PV formula expresses each cash flow that accumulates over time into current dollars. Finally, each PV is summed into a single net present value (NPV) number. This NPV number is then added to the purchase price used for the reference bull to establish the recommended maximum bid price for the prospect bull.

Sensitivity analysis

The advantage of including a sensitivity analysis in decision-making is being able to view the consequences of simultaneously changing several coefficients in a model at the same time.[20] In the pricing model presented here, the user defines the increments of change to occur in two coefficients: purchase price and WW-EPD. The columns and rows of the sensitivity analysis (Table 1) list five different purchase prices and WW-EPDs, respectively. The monetary amount listed at the intersection of a given purchase price column with a given WW-EPD row represents the corresponding maximum bid price to offer.

Twenty-five different bid prices can be viewed simultaneously. The producer has the opportunity to view what the maximum bid price should be if the base price of the reference bull is kept constant, but the weaning-weight EPD advantage of the prospect bull is changed; or what the maximum bid price should be if weaning-weight EPD advantage of the prospect bull is kept constant, but base price of the reference bull is changed; or what the bid price should be for the prospect bull given a simultaneous change in both base price of the reference bull and a change in weaning-weight EPD advantage of the prospect bull.

Discussion

Traditional cow-calf enterprise budgets typically incorporate expenses associated with herd bull owner-

ship into annual cow cost.[6] Consequently, bulls are treated as a key "raw material" to the factory (cow) in order to make the product (calf weight) that a beef enterprise sells. The objective of our analysis was to provide a method that commercial beef cow-calf producers can use to determine a fair price for differing raw material (bull) quality.

Weaning weight was chosen as the basis for valuing bull quality in this pricing model because it is one of the two most economically relevant traits to commercial beef cow-calf producers,[7,9] and because the advent of expected progeny difference (EPD) methodology has facilitated an accurate estimate of average weaning weight differences between future progeny of bulls.[4] The authors are mindful that EPDs exist for many other traits. A focus on weaning-weight EPD in the pricing model was not meant to degrade the importance of other EPDs, or to endorse single trait selection over multiple trait selection.

The utility of this pricing model is best suited for commercial beef cow-calf enterprises that typically use bulls strong in growth traits to meet a breeding program goal of maximizing pounds of calf weaned per cow. It is assumed that a veterinarian is already working closely with this producer to use bulls genetically predisposed to calving ease. Commercial cow-calf operations whose breeding program goal is to use bulls that maximize maternal traits, or one or more of the multitude of other genetic traits for which an EPD has been developed, will probably find this pricing model less useful. In the latter, the basis for valuing bull quality should probably be a maternal trait or other EPD.

Admittedly, EPD is a statistical method based on objective performance information used to predict subsequent genetic transmitting ability of an animal for a particular trait.[4] Consequently, the predictive ability of such a measurement could be questioned. Fortunately, several studies have been published that attest to the validity of weaning-weight EPD as a predictor of subsequent performance of a bull's offspring. In one of these studies,[19] for each 2.2 lb (1.0 kg) predicted difference in weaning-weight EPD of sires examined, the observed average weaning-weight difference in 2,910 crossbred calves was 1.94 ± 0.24 lb (0.88 ± 0.11 kg). In another study of 2,034 crossbred calves, their actual performance was 1.74 ± 0.31 lb (0.79 ± 0.14 kg) per 2.2 lb (1.0 kg) of predicted weaning-weight EPD difference for their respective sire.[17] In a study involving 457 Polled Hereford X Angus calves, the average weaning weight performance was 1.21 ± 0.35 lb (0.55 ± 0.16 kg) per 2.2 lb (1.0 kg) predicted difference in weaning-weight EPD of sires evaluated.[18] A study of 688 straightbred Hereford calves showed that a 2.2 lb (1.0 kg) change in weaning-weight EPD corresponded to a 1.0 ± 0.40 lb (0.45 ± 0.18 kg) change in average 200-day weaning weight.[3] Another study predicted a difference of 11.7 lb (5.3 kg) in average weaning-weight EPD among straightbred Angus progeny of 87 high-growth and 83 low-growth EPD sires.[1] An actual 13.4 ± 10.8 lb (6.1 ± 4.9 kg) weaning weight difference was observed. These studies document a positive correlation between observed and predicted differences in weaning-weight EPD.

It is important to note that weaning-weight EPDs of bulls will definitely change over time.[11] The magnitude of the change can be assessed by consulting a "possible change" table that is a basic component of every sire summary.[11] Referring to the Angus sire summary (Table 2), a weaning-weight EPD with an accuracy of 0.20 (typical for yearling bulls) has a 68% probability of remaining within ±9.27 lb (4.21 kg) of that WW-EPD if more production data is accumulated.[21] In contrast, if a bull had a weaning-weight EPD with an accuracy of 0.90, a 68% probability exists of changing ±1.16 lb (0.53 kg) of that WW-EPD if more production data is accumulated. Nevertheless, for a given accuracy, the EPD listed for a bull is the one expected to occur based upon the probability distribution of current performance information from the individual, its progeny, its siblings and its ancestors compared to those of the average bull of that breed.

Table 2. Accuracy and associated possible change (pounds) of expected progeny difference (EPD) for growth (birth weight, weaning weight, yearling weight) and maternal (milk) traits for the Angus breed.[21]

Accuracy	Birth weight EPD	Weaning weight EPD	Yearling weight EPD	Milk EPD
.05	2.73	11.01	16.17	9.21
.10	2.59	10.43	15.32	8.73
.15	2.44	9.85	14.47	8.24
.20	2.30	9.27	13.62	7.76
.25	2.15	8.69	12.77	7.27
.30	2.01	8.12	11.92	6.79
.35	1.87	7.54	11.06	6.30
.40	1.72	6.96	11.21	5.82
.45	1.58	6.38	9.36	5.33
.50	1.44	5.80	8.51	4.85
.55	1.29	5.22	7.66	4.36
.60	1.15	4.64	6.81	3.88
.65	1.01	4.06	5.96	3.39
.70	0.86	3.48	5.11	2.91
.75	0.72	2.90	4.26	2.42
.80	0.57	2.32	3.40	1.94
.85	0.43	1.74	2.55	1.45
.90	0.29	1.16	1.70	0.97
.95	0.14	0.58	0.85	0.48

Fair price reflects the highest incremental value of benefits over cost. Although bull ownership costs can be many in number and considerable in quantity,[12] this pricing model only considered costs that differed incrementally between bulls.[2] Examples of relevant differential costs include additional feed consumed by one bull but not the other, additional feed consumed by calves with greater growth potential sired by one bull but not the other, and any miscellaneous cost(s) that may involve one bull but not the other (e.g. mortality insurance, additional supplementation).

Since this economic model estimates the benefits and costs over the useful life of a bull, it is also important to consider the time value of money in any calculations performed. In accounting and finance, the term "time value of money" is used to explain that a dollar received today is worth more than a dollar promised at some time in the future.[13,16] The present-value (PV) formula captures the "time value of money" concept. The PV calculation reflects cash flow amounts, discount rate and timing of these cash flows.[13] The lower the discount rate used the higher the PV of discounted cash flow will be, and vice versa. The PV of the same cash flow stream also diminishes with each passing year.

Veterinarians that use this pricing model to help their clients value bulls will find that cow-to-bull ratio, number of breeding seasons that a bull is used and weaned calf crop percentage are the main drivers that alter the amount of premium that can be paid for the prospect bull over the reference bull. Since the total number of calves produced each year is calculated from the combination of these values, and because it is their total body weight increase upon which present value of yearly cash flows is determined, inaccuracies in these numbers have the most dramatic effect on the amount of additional money that can be paid for the prospect bull.

Referring to the arbitrary values entered into the pricing model for illustrative purposes (Table 1), given a base price for the reference bull of $1500, and a +20.00 lb (9.09 kg) WW-EPD advantage for the prospect bull, the recommended maximum bid price for the prospect bull was estimated to be $2,062. In other words, the prospect bull was worth a $562 ($2,062 - $1,500) premium over the reference bull. Changing the cow-to-bull ratio from 20:1 to 30:1 in the pricing model example increases the premium that can be paid for the prospect bull approximately 33% (from $562 premium or $2,062 bid price, to $843 premium or $2,343 bid price). The number of years of bull use has important revenue and expense implications. The more years that a bull is used, the greater number of calves born, and consequently more cumulative revenue is produced from the pounds of weaned calf sold. In contrast, if a bull is culled before its use is fully depreciated from an accounting standpoint, i.e., kept less than six years, its book value usually exceeds the value received at salvage. A loss is realized and added to expenses for the year the bull is culled. Any increase in expense lowers the premium that can be paid for the prospect bull. However, if the bull is culled after six years of ownership, MACRS depreciation has run out, salvage value typically exceeds its book value, and a non-cash gain is booked. Any increase in gain raises the amount of premium that can be paid for the prospect bull. Overestimation of weaned calf-crop percentage will inflate the premium that can be paid for the prospect bull, but less dramatically than errors in cow-to-bull ratio and years of bull use. No matter the variation in cost input and revenue output in this pricing model, overestimation of weaned calf-crop percentage by up to 10% will inflate the premium less than 5% that can be paid for the prospect bull.

The pricing model is also sensitive to any miscellaneous costs assigned to the prospect bull. For example, using the same input values presented in Table 1, but adding $100 of recurring cost (e.g. mortality insurance), lowers the recommended maximum bid price approximately 13% (from $2,062 to $1,794). Even $50 additional cost lowers the recommended maximum bid price approximately 9%. Therefore, producers should give considerable thought to possible costs incurred by the prospect bull but not the reference bull. Failure to recognize these costs will inflate the premium that can be paid for the prospect bull.

Due to the nature of discounted cash flow determination, errors in forecasting future calf prices will not dramatically affect the recommended bid price. For example, when using the same input values presented in Table 1, but decreasing (increasing) estimated calf price by $5/cwt or even $10/cwt for years one through four of bull use, the bid price to offer will decrease (increase) less than 5%. This behavior should hold for the multitude of values that will be entered into the pricing model by a producer.

Conclusions

The pricing model presented here is an attempt by the authors to improve the veterinarian's ability to assist clients in making economic decisions about prices to pay for beef bulls. Admittedly, the accuracy of this decision tool is highly dependent upon using valid production and financial information. Acknowledging that some of the input information is subject to a degree of uncertainty in what represents a true value should not deter a rancher from taking the time to gather this relevant information prior to a bull-buying decision. In the end, this decision tool should help ease the "after-purchase" anxiety and self-doubt that can sometimes overcome some commercial cow-calf producers as they

second-guess themselves over whether the price they paid for the bull was a fair price.

Availability of the Pricing Model

A copy of the pricing model will be made available to any reader upon request to the first author.

Acknowledgements

The authors thank Dr. J. W. Turner, Professor Emeritus, Department of Animal Science, Texas A&M University, College Station, TX, for his valuable suggestions, advice and comments with this manuscript.

Footnotes

[a]Excel 2000, Microsoft Corporation, Redmond, WA

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ISSN 0524-1685

The Bovine PRACTITIONER

Guidelines for Authors

The Bovine Practitioner is the official publication of The American Association of Bovine Practitioners, published in February and June annually. It also serves as a communication medium between bovine practitioner organizations around the world. All manuscripts and communications must be presented in English.

Most articles in the journal are peer-reviewed or refereed. Papers submitted for publication in the peer-reviewed section are anonymously reviewed by three members of the editorial board. In some cases, papers may be reviewed by an outside expert(s) who is not a regular member of the editorial board. Papers published in the peer-reviewed section of the journal will be identified with a "Peer-Reviewed" banner at the top of the first page. Papers rejected by the editorial board for publication as peer-reviewed articles do not automatically qualify for publication in the non-peer-reviewed sections.

Articles published in *The Bovine Practitioner* are intended to address the needs of bovine practitioners. Types of articles considered appropriate for the journal include research reports, case reports, review articles, retrospective studies and articles describing new techniques.

All papers should begin with an abstract. Research reports should follow with an introduction, materials and methods (including experimental design and statistical analysis), results, discussion and conclusions. At the author's discretion, results and discussion may be combined.

Case reports should be written to include an introduction, history, clinical findings, appropriate laboratory data, surgical/therapeutic management, discussion and conclusions.

Review articles covering topics important to the practitioner are welcome. They should address more recent advances and bring the reader cutting edge information related to bovine practice or to beef or dairy production.

Papers reporting retrospective studies should include an introduction, clinical implications or objectives of the study, the methodology used to evaluate the data, a section that details the significance of the findings to the practitioner and conclusions.

Two manuscripts and a diskette should be submitted to the editor through the mail or via a parcel delivery service. Manuscripts should be double-spaced, using 12-point Times type and 1-inch margins. Both lines and pages should be numbered. When possible Microsoft Word should be used.

Figures, tables and photographs are welcome. Figures should be numbered on the back: legends for figures should be submitted on a separate sheet of paper. When photographs are submitted, prints are preferred over 2x2 slides.

English units of measure should be used for weights, measures and temperature. If the author desires, it is acceptable to follow English units with metric units in parenthesis, i.e....440 lb (200 kg) steer had a rectal temperature of 101.5°F (38.6°C). When the use of brand names is necessary, they should be listed in footnotes, including the name of product, manufacturer, and manufacturer's city and state.

References to literature cited in the paper must be identified in the text by the use of superscripts. References should be listed in **alphabetical order**. Suggested style for citations in the reference section is as follows:

1. Allen WM, Sansom BF: Parturient paresis (milk fever) and hypocalcemia (cows, ewes, and goats), in Howard JL (ed): *Current Veterinary Therapy III. Food Animal Practice.* Philadelphia, WB Saunders Co, 1993, pp 304-308.
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All correspondence and manuscripts should be addressed to:

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Rev 06/03

Excenel® RTU

Pharmacia &Upjohn

brand of ceftiofur hydrochloride sterile suspension

For intramuscular and subcutaneous use in cattle. This product may be used in lactating dairy cattle.

CAUTION: Federal (USA) law restricts this drug to use by or on the order of a licensed veterinarian.

INDICATIONS

EXCENEL RTU Sterile Suspension is indicated for treatment of the following bacterial diseases:

- Bovine respiratory disease (BRD, shipping fever, pneumonia) associated with *Mannheimia* spp. *(Pasteurella haemolytica)*, *Pasteurella multocida* and *Haemophilus somnus.*
- Acute bovine interdigital necrobacillosis (foot rot, pododermatitis) associated with *Fusobacterium necrophorum* and *Bacteroides melaninogenicus.*
- Acute metritis (0 to 14 days post-partum) associated with bacterial organisms susceptible to ceftiofur.

CONTRAINDICATIONS

As with all drugs, the use of EXCENEL RTU Sterile Suspension is contraindicated in animals previously found to be hypersensitive to the drug.

DOSAGE AND ADMINISTRATION

– For bovine respiratory disease and acute interdigital necrobacillosis: administer by intramuscular or subcutaneous administration at the dosage of 0.5 to 1.0 mg ceftiofur equivalents/lb (1.1 to 2.2 mg/kg) BW (1 to 2 mL sterile suspension per 100 lb BW). Administer daily at 24 h intervals for a total of three consecutive days. Additional treatments may be administered on Days 4 and 5 for animals which do not show a satisfactory response (not recovered) after the initial three treatments. In addition, for BRD only, administer intramuscularly or subcutaneously 1.0 mg ceftiofur equivalents/lb (2.2 mg/kg) BW every other day on Days 1 and 3 (48 h interval). Do not inject more than 15 mL per injection site.

Selection of dosage level (0.5 to 1.0 mg/lb) and regimen/ duration (daily or every other day for BRD only) should be based on an assessment of the severity of disease, pathogen susceptibility and clinical response.

– For acute post-partum metritis: administer by intramuscular or subcutaneous administration at the dosage of 1.0 mg ceftiofur equivalents/lb (2.2 mg/kg) BW (2 mL sterile suspension per 100 lb BW). Administer at 24 h intervals for five consecutive days. Do not inject more than 15 mL per injection site.

Shake well before using.

WARNINGS

NOT FOR HUMAN USE.
KEEP OUT OF REACH OF CHILDREN.

Penicillins and cephalosporins can cause allergic reactions in sensitized individuals. Topical exposures to such antimicrobials, including ceftiofur, may elicit mild to severe allergic reactions in some individuals. Repeated or prolonged exposure may lead to sensitization. Avoid direct contact of the product with the skin, eyes, mouth, and clothing.

Persons with a known hypersensitivity to penicillin or cephalosporins should avoid exposure to this product.

In case of accidental eye exposure, flush with water for 15 minutes. In case of accidental skin exposure, wash with soap and water. Remove contaminated clothing. If allergic reaction occurs (e.g., skin rash, hives, difficult breathing), seek medical attention.

The material safety data sheet contains more detailed occupational safety information. To report adverse effects in users, to obtain more information or obtain a material safety data sheet, call 1-800-253-8600.

RESIDUE WARNINGS: Treated cattle must not be slaughtered for 48 hours (2 days) following last treatment because unsafe levels of drug remain at the injection sites. No milk discard time is required when this product is used according to label directions. Use of dosages in excess of those indicated or by unapproved routes of administration, such as intramammary, may result in illegal residues in edible tissues and/or in milk. A withdrawal period has not been established in pre-ruminating calves. Do not use in calves to be processed for veal.

PRECAUTIONS

Following intramuscular or subcutaneous administration in the neck, areas of discoloration at the site may persist beyond 11 days resulting in trim loss of edible tissues at slaughter. Following intramuscular administration in the rear leg, areas of discoloration at the injection site may persist beyond 28 days resulting in trim loss of edible tissues at slaughter.

STORAGE CONDITIONS

Store at controlled room temperature 20° to 25° C (68° to 77° F) [see USP]. Shake well before using. Protect from freezing.

HOW SUPPLIED

EXCENEL RTU Sterile Suspension is available in the following package size:

100 mL vial NDC 0009-3504-03

NADA #140-890, Approved by FDA

U.S. Patent Nos. 4,902,683; 5,736,151

Pharmacia & Upjohn Company • Kalamazoo, MI 49001, USA

Revised January 2002

816 323 307B
692431
3504-03-000

Micotil® 300

Tilmicosin Injection, USP

CAUTION: Federal (USA) law restricts this drug to use by or on the order of a licensed veterinarian.

HUMAN WARNINGS: Not for human use. Injection of this drug in humans may be fatal. Keep out of reach of children. Do not use in automatically powered syringes. Exercise extreme caution to avoid accidental self-injection. In case of human injection, consult a physician immediately. Emergency medical telephone numbers are 1-800-722-0987 or 1-317-276-2000. Avoid contact with eyes.

NOTE TO PHYSICIAN: The cardiovascular system appears to be the target of toxicity. This antibiotic persists in tissues for several days. The cardiovascular system should be monitored closely and supportive treatment provided. Dobutamine partially offset the negative inotropic effects induced by Micotil 300 in dogs. ß-adrenergic antagonists, such as propranolol, exacerbated the negative inotropy of Micotil-induced tachycardia in dogs. Epinephrine potentiated lethality of Micotil 300 in pigs.

For Subcutaneous Use in Cattle and Sheep Only. Do Not Use in Automatically Powered Syringes.

Indications: Micotil 300 is indicated for the treatment of bovine respiratory disease (BRD) and ovine respiratory disease (ORD) associated with *Mannheimia (Pasteurella) haemolytica.* Micotil 300 is indicated for the control of respiratory disease in cattle at high risk of developing BRD associated with *Mannheimia (Pasteurella) haemolytica.*

Description: Micotil 300 is a solution of the antibiotic tilmicosin. Each mL contains 300 mg of tilmicosin, USP as tilmicosin phosphate in 25% propylene glycol, phosphoric acid as needed to adjust pH and water for injection, q.s. Tilmicosin, USP is produced semi-synthetically and is in the macrolide class of antibiotics.

Actions: Activity — Tilmicosin has an *in vitro*** antibacterial spectrum that is predominantly gram-positive with activity against certain gram-negative microorganisms. Activity against several mycoplasma species has also been detected.

Ninety-five percent of the *Mannheimia (Pasteurella) haemolytica* isolates were inhibited by 3.12 µg/mL or less.

Microorganism	MIC** (µg/mL)
Mannheimia (Pasteurella) haemolytica	3.12
Pasteurella multocida	6.25
Haemophilus somnus	6.25
Mycoplasma dispar	0.097
M. bovirhinis	0.024
M. bovoculi	0.048

**The clinical significance of this *in vitro* data in cattle has not been demonstrated.

Directions — Inject Subcutaneously in Cattle and Sheep Only. Administer a single subcutaneous dose of 10 mg/kg of body weight (1 mL/30 kg or 1.5 mL/100 lbs). Do not inject more than 15 mL per injection site. Do not use in lambs less than 15 kg body weight.

If no improvement is noted within 48 hours, the diagnosis should be reevaluated.

For cattle, injection under the skin behind the shoulders and over the ribs is suggested.

For sheep, injection in a skin fold behind the shoulders and over the ribs is suggested.

Note — Swelling at the subcutaneous site of injection may be observed but is transient and usually mild.

CONTRAINDICATION: Do not use in automatically powered syringes. Do not administer intravenously to cattle or sheep. Intravenous injection in cattle or sheep will be fatal. Do not administer to animals other than cattle or sheep. Injection of this antibiotic has been shown to be fatal in swine and non-human primates, and it may be fatal in horses and goats.

CAUTION: Do Not Administer to Swine. Injection in Swine Has Been Shown to be Fatal.

WARNINGS: Animals intended for human consumption must not be slaughtered within 28 days of the last treatment. Do not use in female dairy cattle 20 months of age or older. Use of tilmicosin in this class of cattle may cause milk residues. Do not use in lactating ewes if the milk is intended for human consumption.

CAUTION: The safety of tilmicosin has not been established in pregnant cattle and in animals used for breeding purposes. Intramuscular injection will cause a local reaction which may result in trim loss. The safety of tilmicosin has not been established for sheep with a body weight of less than 15 kg or in pregnant sheep or sheep used for breeding purposes.

How Supplied: Micotil 300 is supplied in 50 mL, 100 mL and 250 mL multidose amber glass bottles.

Storage: Store at room temperature, 86˚F (30˚C) or below. Protect from direct sunlight.

*Elanco®, Micotil® and the diagonal color bar are trademarks of Eli Lilly and Company.

Text revised September 4, 2002

Manufactured for:
Elanco Animal Health
A Division of Eli Lilly and Company
Indianapolis, IN 46285, USA

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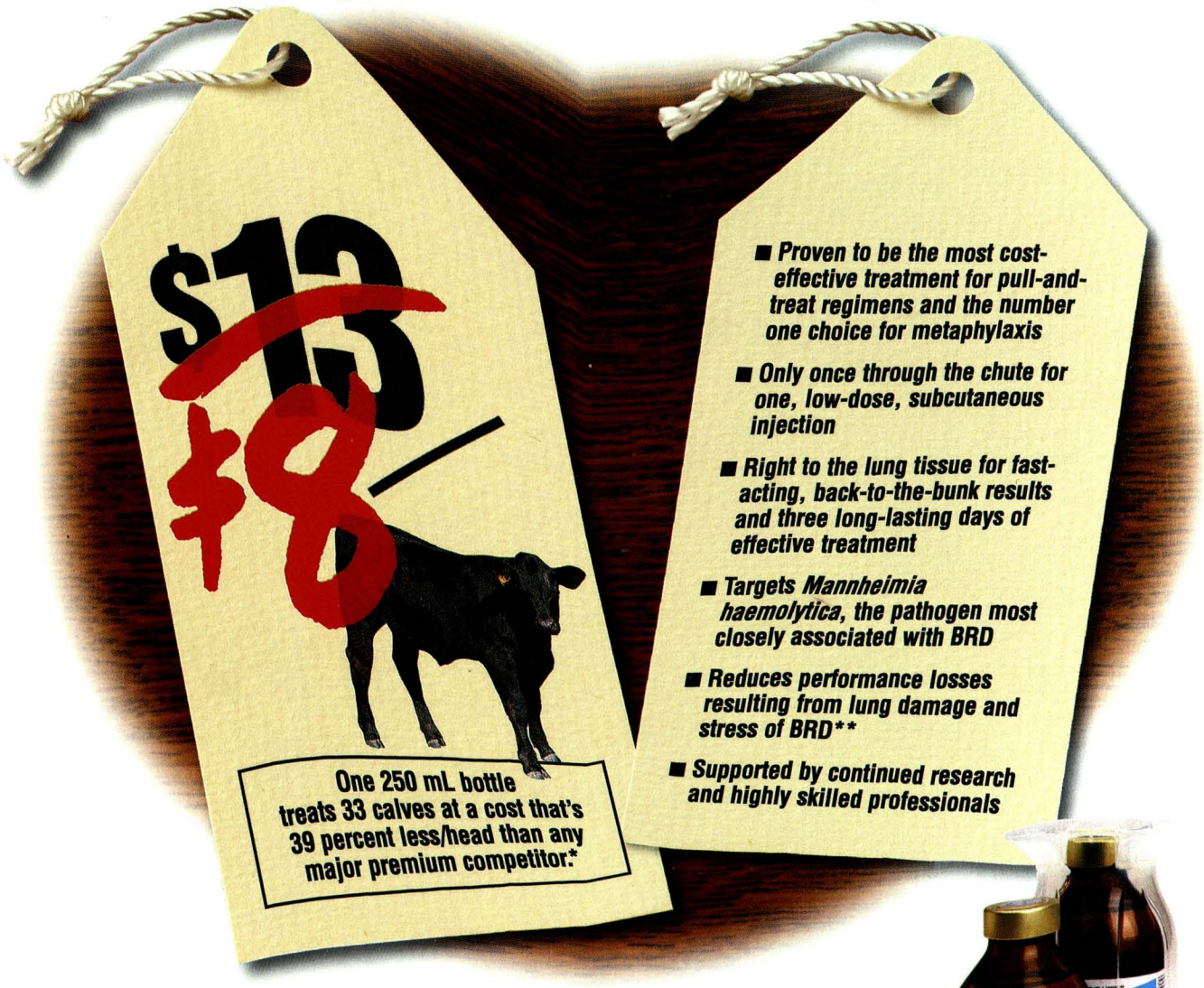
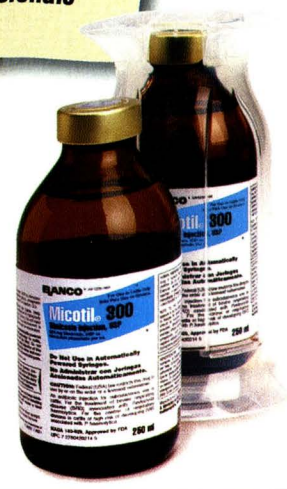
NADA 140-929, Approved by FDA
PA9041DEAMP

The lowest treatment cost.

The highest value.





When a product consistently performs well for your clients and its application is both easy for them and easy on their cattle, you might expect it to cost as much or more than the competition. Micotil® is clearly different, and it's a difference that may surprise you. Here's the bottom line — your clients can spend about $10 to $14 per treatment for other premium products ($13 is the combined average*) or you can prescribe a 250 mL bottle of Micotil that treats 33 head for just under $8 per treatment. So when it comes to helping your clients boost their bottom line, be sure to compare price tags… both sides of the tag.

Micotil is to be used by, or on the order of, a licensed veterinarian. Administer subcutaneously to cattle only. Intravenous use in cattle will be fatal. Do not use in female dairy cattle 20 months of age or older. Use in lactating dairy cattle may cause milk residues. See label for complete use information, including human warnings. Always use proper drug handling procedures to avoid accidental self-injection.

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*Based on 500-pound calf; current market price as compared to the combined average treatment cost of Nuflor®, Baytril®, A180®, Excenel® and Naxcel®. Market price may vary.

**Wittum TE, Woollen NE, Perino LJ, et al: Relationship among treatment for respiratory tract disease, pulmonary lesions evident at slaughter, and rate of weight gain in feedlot cattle. J Am Vet Med Assoc 209:814–818, 1996.

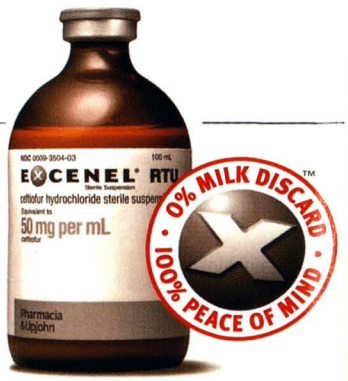
Micotil® is a trademark for Elanco's brand of tilmicosin.

Stop it.

Use Excenel® RTU Sterile Suspension
(ceftiofur hydrochloride)

- **Zero milk discard**
- **Approved for metritis, BRD and foot rot**
- **Ready to use – no refrigeration or preparations needed**
- **Results without risk***
  *When used according to label directions

As with all drugs, Excenel RTU should not be used in animals found to be hypersensitive to the product



EXCENEL® RTU
Sterile Suspension
(ceftiofur hydrochloride)

See back of book for product summary.