

## Economic Impacts Associated With Recombinant Bovine Somatotropin (rBST) Use: Reply

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Losinger's criticism of our paper pertains to the following key points: the use of national estimates, the functional form employed, making multiple uses of the model, not considering all the costs, and the use of NAHMS data for economic analysis. We briefly address each one below, beginning with the last:

The use of NAHMS data for economic analysis was done as we outlined in the paper by progressing from the physical relationships to the economic. Current NAHMS national studies, including Dairy '96, collect little economic information. However, productivity parameters, such as milk production per cow, can be collected and used to estimate the association between disease and productivity. Changes in gross revenue can then be determined by multiplying the output prices by the estimated productivity changes.

As suggested, we did not collect complete production cost data, thus (as stated in the paper) we relied on the cost estimates of others.

Why use a similar model multiple times? The first model mentioned in the commentary was developed to determine economic impact associated with Johne's disease. Several parameters can affect productivity at the herd level, the level at which NAHMS data is collected. Thus, the model included parameters other than Johne's disease that are associated with herd level milk production per cow. Among the included parameters were bulk tank somatic cell count (BTSCC) and rBST use.

In modeling milk response to rBST use, inspection of plotted data points did not reveal any particular functional form. The square root function was chosen due to a slightly higher R-square than the quadratic. While the Ott-Novak manuscript and our manuscript could have been written from this model, they were not, as the Johne's disease variable reduced the number of observations by approximately 20 percent. Accordingly, in the revised specification we dropped the Johne's disease variable and increased the sample size. Analysis for the Ott-Novak manuscript was done first and no further investigation of rBST was done for that manuscript.

It is not the "tweaking" of the model that gives rise to multiple publications, but the subject matter covered. The difference in impact associated with BTSCC between the Ott-Novak and Ott-Rendleman publications is less than one percent. Their true differences are in the variables of interest: rBST vs. BTSCC, and thus both make contributions to the literature.

It should be noted that the first draft of the article included both quadratic and square root functional forms for rBST. The final version of the article accepted by *AgBioForum* for publication included only the quadratic form. This was because brevity was requested and because the associated marginal product is linear.

One concern the commentator had with the quadratic function form equation was the decline in milk production when rBST use exceeds 87 percent. When rBST use is divided into 10 percent intervals with 0 and 100 percent as separate categories the 60-69 percent category had the highest milk production per cow. Thus, very high levels of rBST use have marginal physical product very close to zero as did our model. While it is indeed unlikely that rBST use beyond 87 percent would depress milk production it makes no serious difference in this case. Whether the milk response is estimated using a quadratic equation or a square-root equation, the conclusions remain the same: that rBST use does increase milk production and is profitable to use; that producers should be checking individual cow response as some cows may have limited-unprofitable response; and that with rBST being profitable its use most likely will increase and thus the need to have fewer cows and therefore fewer dairy producers to produce a given quantity of milk.

Regarding the use of national estimates, Losinger is technically correct. In practice however, this is an insignificant issue. NAHMS studies are designed to represent at least 80 percent of the national population. To be statistically correct, instead of multiplying by all the cows in the country to determine national impact we should multiply by 83 percent of the cows to make an estimate

for these cows and leave the reader to guess what the national impact would be from the remaining 17 percent of cows. Most likely the reader would assume the same per cow effect and thus obtain the same national impact as the one we provided.